Fairfield UNIVERSITY

School of Engineering

Dual-Degree Program
Master of Science Degree
In

Electrical and Computer Engineering

INTRODUCTION

We propose that the School of Engineering (SOE) create a new degree structure in Electrical and Computer Engineering (ECE), a dual-degree 5-year BS/MS course of study, by combining the curricula for the BS degree and the Master of Science degree in this discipline, both now being offered in the SOE. This new initiative responds to changes in the economic climate, and the constantly evolving needs for innovation in engineering design and development, across all technological and economic sectors. An ECE graduate has knowledge that is acutely needed in contemporary society. Graduates of the program will be awarded a BS in Computer Engineering or a BS in Electrical Engineering with an MS in ECE. The two different programs will remain different at the undergraduate level (with each having a separate accreditation) but remain combined at the graduate level.

1. Overview and Summary

Graduate engineering education is now a key to innovation and creativity in technology, and central to the national economy, social welfare, security, and management. There is a dramatic change in the role of, and increased emphasis on, master's level engineering education. The gateway to Master's degree programs is a rigorous undergraduate education. Under these circumstances, new pathways to advanced degrees in science and engineering have been established in some schools. For example, MIT now has a 5-year program that provides students with a dual *BS/MS* degree in engineering. This change reduces the time to a master's degree by one or more years.

In this spirit we propose the 5-year dual-degree program resulting in a BS degree in Computer **or** Electrical Engineering and an MS degree in the discipline of Electrical **and** Computer Engineering. The new program will embrace the educational objectives of the traditional undergraduate program, as well as those of the graduate program. It will also emphasize experiential learning in terms of summer industrial internships following the sophomore year, and graduate courses that guide students through a process of design and innovation at the level of a professional engineer. Graduates of the program will have mastered the knowledge and tools they need to create the next generation of computer solutions to technological and societal problems.

The proposed program is in accord with the mission and strategic plan of the School of Engineering to create skilled engineers with a well-developed cultural orientation, an understanding of economic values, and a sense of ethical and social responsibility.

2. Need and Opportunity

The proposed program is supported by the SOE to leverage its available resources so as to create an accelerated learning environment for undergraduate students.

Education is a means toward increasing human capital leading to improved productivity and endogenous substantial and sustainable economic growth. The Bureau of Labor Statistics reports that jobs in computer engineering and in computer support services are among the top ten professions (teachers and registered nurses lead the list). These two sectors will see net gains of 307,000 and 420,000, respectively, through the year 2012, i.e., 45.5% and 39.4% increases.

Even in these tighter economic times, new engineering bachelor's degree graduates earn some of the highest starting salaries and unemployment has not hit the profession as hard as others: in 2009 the Bureau of Labor Statistics indicates that 6.9 percent of engineers were unemployed versus 9.3 percent of all workers. The median salary for Computer Engineers is $97,400 and the median salary for Electrical Engineers is $82,160. Source: **http://www.bls.gov/oco/ocos027.htm#projections_data.**

While salaries have been going up, the number of MS engineering degrees has declined. The number of master's degrees awarded in engineering dropped 1.7% in 2007, following a 6.4% decrease in 2006. A total of 37,803 engineering master's degrees were awarded in engineering in 2006, down from 38,451 in 2006 and the record high of 41,087 in 2005. Source: *Engineering & Technology Degrees*, 2007, a report from the Engineering Workforce Commission (EWC).

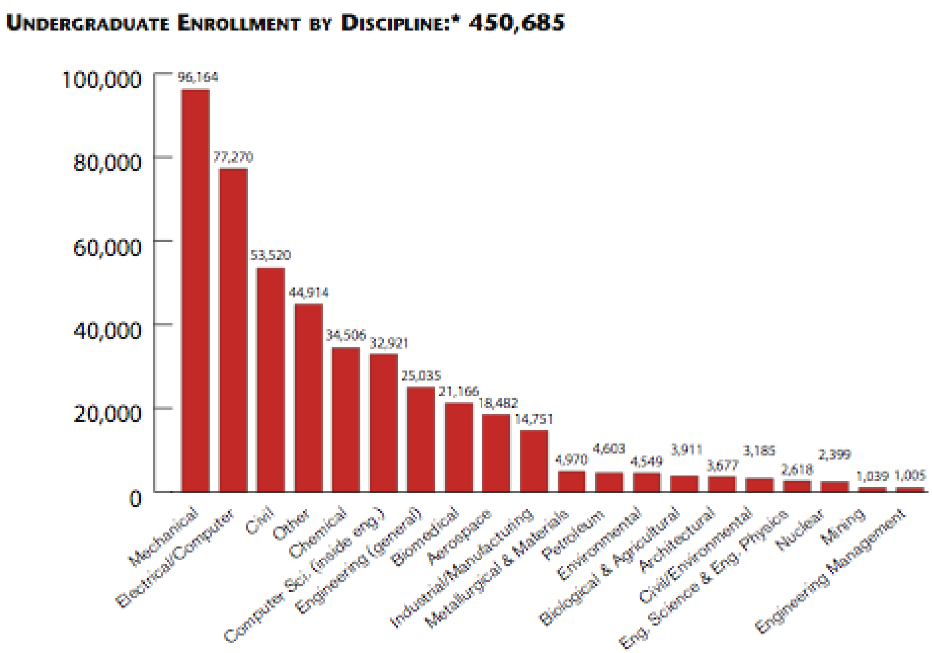

Figure 1. EE/CpE is the Second Most Popular Engineering Degree

Figure 1 shows that Electrical and Computer Engineering is, nationwide, the most popular engineering degree, next to Mechanical Engineering.

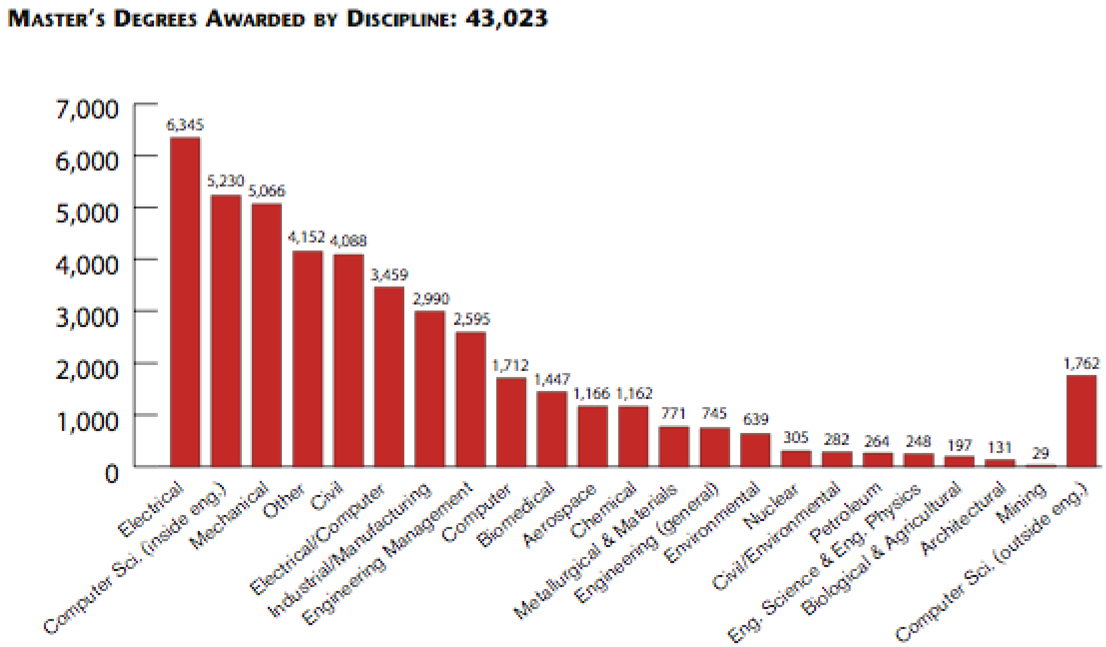

Figure 2. Electrical and Computer Engineering

Figure 2 shows that when we combine Electrical and Computer Engineering we have the most popular engineering MS degree in the country [www.asee.org/colleges]. According to the Census Bureau's Population Estimates Program, Connecticut ranks 3rd in the country (behind New York and Massachusetts), with 13.6% of it population in the 25-34 age group having a graduate or professional degree. Thus, these MS degrees are highly sought after.

Electrical and Computer Engineering solutions are ubiquitous in all facets of the technology that serves as the economic engine in advanced and developing countries. The economies of all countries that belong to the Organization for Economic Cooperation and Development (OECD) depend on the development and implementation of computer products. Labor productivity and higher revenue streams in all developed economies are correlated to the efficiencies created by computer technologies. In the last decade, virtually all of America's increase in labor productivity growth came from either increased computer-based capital expenditures or productivity gains in the IT sector.

The rest of the world, e.g., Japan, China, and Europe, is catching up fast. In the United States, the importance of computer development continues to increase as the economy continues its transformation into a more service-and knowledge-based activity with human creativity and physical capital as the drivers of economic growth. Some colleges and universities have been responding in the last three years by increasing the number of BS degree graduates in computer engineering and IT.

The industrial and business environment in southern Connecticut is extremely favorable to jobs for graduates and internships for students in the computer engineering programs at Fairfield. Sixty of the State's one hundred largest industrial and service companies and twelve of the 25 largest banks are within 30 miles of the Fairfield campus, from Greenwich to New Haven and from Fairfield to Ridgefield and Shelton. This list includes General Electric, United Technologies, Xerox, Pitney Bowes, Hubbell Inc., Pharma, and many others. The SOE Advisory Board and the SOE alumni provide additional means for cementing the School's relations with the technology and business environment. The proposed program will make deeper the pool of expert talent to satisfy the needs of social and economic institutions in the State.

A growing fraction of the student population in the ECE Master's program consists of international students who are attracted to the Fairfield program over others in neighboring institutions, but are gearing up to return to their country of origin following their Master's degree and a year of practical training. This appears to be the general trend throughout the country. Should it continue, it is likely to leave the US with a short supply of talent in Computer Engineering, and a reduced competitiveness, at a time when skills and talent are most needed in the face of galloping globalization. This was shown in *Computing the Gains: The economic benefits of the IT revolution are now visible in Europe and Japan,* The Economist, 23 Oct 2003 and in PRISM, American Society of Engineering Education, March 2006.

MASTER'S DEGREES BY RESIDENCY, 2010

	2001	2002	2003	2004	2005	2006	2007	2008	2009
Foreign National	43.0%	42.1%	46.0%	45.5%	42.6%	39.8%	38.7%	41.7%	44.1%
Domestic	57.0%	57.9%	54.0%	54.5%	57.4%	60.2%	61.3%	58.3%	55.9%

Figure 3. MS Engineering Degrees by Residency

The ASEE report shows that the number of degrees awarded to foreign nationals is again on the rise, indicating a trend toward a drain of the very innovation and engineering entrepreneurship this country needs, at a time when it needs it most (during a time of precarious economic recovery).

The five-year BS/MS program mitigates this trend by bringing into the discipline talented students at the crucial first step in their college career, and assisting them to attain professional status in a timely manner.

Table I, below, shows the number of graduates from the separate undergraduate and graduate programs in the last 6 years. The proposed program will bring a better balance between the two segments of college education in Electrical and Computer Engineering at Fairfield University.

Year	MSECE	BS CpE	BS EE
2006	2	3	10
2007	11	4	2
2008	7	1	7
2009	12	5	4
2010	12	1	4
2011	3	3	4
2012	15	4	9

Table I. Graduates for the years 2006-2011

The first year that the ECE MS program had graduates was 2006. Providing a path to an MS degree should enable a smoother transition into the graduate program and encourage undergraduates to seek a graduate degree.

3. Rationale. Reasons for the program

In the face of the on-going international movement toward globalization that has changed the way industry and technology work, academic institutions will need to identify the best way to prepare their students for work in this environment. This question is most crucial in the case of engineering and the more applied of the sciences. It is reiterated that one answer might be a new degree structure like the 5-year program proposed here.

Given the fact that the number of universities that offer ECE degrees is relatively small, and the need for computer development to solve complex problems across all sectors of technology is skyrocketing, the SOE has a responsibility to assist in the education of experts in this discipline. The proposed program will enable students to enter graduate studies in ECE in a timely manner in order to achieve positions of responsibility in their companies early in their career.

The School of Engineering has the responsibility to illustrate and articulate to students the societal need for computer and systems design and development in support of the processes that shape daily life. Hence the School must use its resources creatively to provide effective access to knowledge in this engineering discipline.

There is a further factor that favors the 5-year approach to the BS/MS degree. Increasingly, engineering organizations and practitioners are saying that the body of knowledge necessary to practice engineering is beyond the traditional four-year Bachelor's degree program. Furthermore, momentum is building toward requiring education beyond the BS degree in order to become a Professional Engineer. At a time when technical complexity has increased, the fifth year in engineering education to produce a graduate who can perform at the Professional Engineer level might be justified. For comparison purposes, medicine, law, pharmacy, architecture and occupational therapy, all require more formal education than engineering does at the level of the present four-year BS curriculum.

4. Objectives. What does the program seek to accomplish?

The ECE 5-year dual degree program enables its graduates to practice in the ECE profession one year sooner than students that take the normal path. The MS degree program educates and assists its students to become accomplished professionals in their discipline in the first few years of their career, following graduation from Fairfield University. For this purpose students in the program will acquire the knowledge and skills to:

- Analyze, design, verify, validate, implement and maintain computer systems,
- Appropriately apply discrete mathematics, probability and statistics, and relevant areas of computer science and supporting disciplines to complex computer systems, and
- Be able to work in depth in one or more significant application domains.

The SOE wishes to provide an alternative avenue to interested students who wish to achieve personal and professional growth and success in a more time-effective manner, the program demands rigor and manifested intellectual discipline. The students admitted to the program will have a cumulative GPA of 3.0 or higher, and a GPA in the Computer or Electrical Engineering programs of 3.2 or higher, in their junior year when they declare their intention to follow the 5-year track. Those students will be able to round out their knowledge through a senior-year curriculum enriched with graduate level courses, and experience an even more rigorous fifth year of advanced studies.

Finally, the proposed 5-year program is in accord with the mission of the School of Engineering and, by extension, with the mission of Fairfield University as a comprehensive Jesuit institution that values intellectual rigor and service to faith and justice on the part of all its students. As a point of reference, the SOE mission statement included in most of its publications is as follows:

The Mission of the School of Engineering is to maintain the highest level of institutional integrity and remain committed to the Ignatian ideals of education, namely intellectual rigor, service to others and service to faith, with the promotion of justice for all.

In pursuit of this mission, the School of Engineering will commit its resources to the nurturing of the intellectual capital and skills of students across disciplines. The school will act to assemble and maintain the material resources needed to support a robust working and learning environment. The School's graduates will have mastered theoretical and practical knowledge of engineering skills, and will have acquired additional competencies in communication, critical judgment, social responsibility and a sense of economic, environmental, and ethical values. These men and women will be prepared to shape the future. They will practice the engineering disciplines and allied activities in many areas of human endeavor, including industry /manufacturing, business, government service and education, or continue with postgraduate studies. Finally, the School will maintain a continuous engagement with the community it aims to serve, and strengthen its commitment to the promotion of excellence in engineering education by serving the manpower and professional needs of industry and business. The SOE provides options to Connecticut engineers for lifelong education and renewal of skills. The SOE serves all its constituencies with integrity, clarity of purpose and professionalism. Toward that end the SOE has adopted the following students learning and pedagogy tenets:

- We make a close relationship between the students and the SOE the top priority.
- Faculty are involved with programmatic, curricular, and pedagogical change;
- Faculty grow professionally through publication and conference attendance.
- Faculty keep close ties to industry
- Faculty are dedicated to active learning

The proposed program is in full accord with the objectives articulated in the SOE mission statement.

5. Impact

The proposed program will not replace any existing one; the program will not drain students or resources from existing programs. On the contrary, it will impact beneficially the number of undergraduates who choose Computer Engineering as a course of study, and as a professional career, and will leverage effectively the resources that are already present in the School of Engineering. It will be a more focused program overall, with the fifth year providing ample opportunity for a deeper understanding of the nuts and bolts of the discipline, as well as intensive research and development in the framework of Capstone Project courses. Appendix D shows a list of students who completed a MS Thesis and a list of student publications.

6. Program Detail

6.a. Benchmarking 5-year degree ECE MS programs:

It is always instructive to benchmark a new program against similar or equivalent programs in other institutions:

- University of Illinois. Urbana-Champaign: Five-year degree BS/MS program in computer science. BS component: 120 credits; same required courses as the traditional BS degree (out of a total of 129-132), plus 3 graduate level courses in architecture, theory, and Computer; GPA of 3.5 MS component: 16 additional credits in graduate course work plus 4 credits of the MS thesis; overall GPA of 3.0 maintained through completion of the MS component of the program.

- Santa Clara University: Five-year BS/MS in Computer Engineering or Computer Engineering. Under the combined B.S./M.S. Program, a full-time SCU undergraduate student can begin work on courses required for a master's degree before the B.S. degree requirements are complete, typically leading to a master's degree in computer engineering or Computer Engineering within a year of obtaining the bachelor's degree. The regular full-time undergraduate fees cover tuition for up to 16 units of graduate courses taken during the senior year. No course can be used to simultaneously satisfy requirements in both the BS and MS degree programs. Students in this program will receive a BS degree after satisfying the standard undergraduate degree requirements. To earn the MS degree, students must fulfill all the requirements for the MS degree specified in the graduate catalog.

- University of California, Berkeley: Five-Year BS/MS in Computer Engineering. It is expected that 5th year students will follow the generic program shown below, meeting all of the requirements for the EECS MS degree while also broadening their experiences. Student use the spring semester of their senior year to formulate and begin work on their MS project to insure they will be able to finish it by the end of their fifth year. The outline of the 5th year curriculum is as follows: Fall: EE/CS 299 (I unit) 2 Grad EECS courses in area of technical depth (8 units) 1-2 courses outside EECS in area of breadth (4-6 units) Spring: EE/CS 299 (2 units) 1 Grad EECS course in area of technical depth (4 units) 1-2 courses outside EECS in area of breadth (4-6 units)

- University of Miami: BS/MS 5-YEAR PROGRAM; this program permits students to receive a baccalaureate degree (BSEE) and a Master of Science (MS) degree in five years. The two degrees are awarded simultaneously when the combined requirements have been met for both degrees. Qualified students who want to be enrolled in this program must apply before the end of their junior year and meet all pertinent graduate school requirements, including a minimum of 3.0 GPA and a satisfactory GRE score. In lieu of the 6-credit thesis requirement, participants may complete either one significant design project or two shorter duration projects. The design projects are monitored by at least two mentors; one of the mentors must be a member of the primary faculty in the department. The projects are completed by the acceptance of a verbal presentation and a written report by the student's mentors. The thesis option requires an oral defense.

- The University of Massachusetts at Amherst: BS/MS 5-YEAR PROGRAM; This program offers a BS in EE or Computer and Systems Engineering as well as ECE MS. During the first 4 years, additional graduate-level courses are taken that are transferred into the MS program. Eight additional courses are taken including two additional project courses during the summer.

- The University of California at San Diego; ECE BS/MS program in 5 years. No GRE required, for admission; But a GPA of 3.0 or better with strong letters of recommendation is required. Students begin graduate level coursework in the senior year.

- Georgia Tech; ECE BS/MS program in 5 years. Application is done in the junior year and the application fee is waived. There is no GRE required. The GPA minimum for admission is 3.5. A letter of recommendation is required. There are additional special requirements for those who plan for the Ph.D. option.

- Carnegie Mellon: ECE BS/MS program in 5 years. They use a "unit" system that is not easy to translate into our credit system. A "B" or better is required for undergraduates to be considered for admission into the program after the completion of 96 "units".

- George Washington University: ECE BS/MS program in 5 years. They require 8 additional graduate level courses for a total of 24 credit hours. There is no MS thesis requirement. A GPA minimum of 3.0 is required by the end of the 8th term of the BS program. There is no GRE requirement.

- Drexel University: ECE BS/MS program in 5 years. They award the BS and MS diploma at the same time. Admission requires 90 credit hours in the BS program with GPA of at least 3.3. There is no GRE requirement. The thesis is optional. Drexel is on a tri-semester system.

- University of Minnesota: ECE BS/MS program in 5 years. Students need 79 credit hours with a GPA of 3.4 of better. The GRE is not required, nor are letters of recommendation. An additional 24 graduate credit hours are required. The thesis is optional.

6.b. The 5-year program at Fairfield University-Academics

Several elements of the programs presented above will be adopted for the 5-year program. In general terms, the education will include:

- Mathematics as a formal basis for the discipline.

- Principles, which constitute the lasting concepts that, underlie the discipline.

- Practices that include specialized skills, patterns and techniques.

- Applications of both principles and practices.

- Tools that must be state-of-the-art; e.g., computer-aided Computer engineering.

6.b.I. Changing from Undergraduate to Graduate Status

Students may request a change of status from the undergraduate to the undergraduate/graduate combined plan of study at any point after the following conditions are met:

- Completed 98 credits towards the BS in Electrical or Computer Engineering.
- Completed all required Junior-level (300-level) math and EE or CpE courses specified in the undergraduate catalog.
- For Computer Engineering, students will have successfully completed 6 courses in Computer Engineering or Computer Science with a GPA of 3.2, and are enrolled in at least one graduate course in the ECE MS program at the time the change is requested.
- For Electrical Engineering, students will have successfully completed 6 courses in Electrical Engineering with a GPA of 3.2, and are enrolled in at least one graduate course in the ECE MS program at the time the change is requested.
- Have an overall GPA of 3.0 or higher.

Students are also required to submit two letters of recommendation, one of which must be from their faculty advisor.

The educational goals and content of the graduate studies under this program are essentially the same as in the ECE Master's Degree Program, but the curriculum is arranged differently in order to allow completion of the requirements for two degrees in five years.

Students follow the standard undergraduate curriculum for the first three years, and then complete the BS degree requirements during their fourth year while taking graduate courses. During the fifth year the students take an additional eight courses to complete their MS degree. In addition, they may participate in internships between their third and fourth years, and would then be directed to take one elective graduate course during the summer between the fourth and fifth year, in order to expeditiously complete the program requirements.

Students will be awarded the BS degrees and MS degrees when the requirements in Table II are satisfied. The Accreditation Board for Engineering and Technology, ABET, requires that students complete a Senior Design project, as part of the BS degree curriculum.

6.b.II. Educational Goals of the Curriculum

The proposed program will provide students with the knowledge and skills to innovate and lead in their discipline in the framework of research and development in academic institutions, research institutions, service organizations and a wide variety of science, technology or business domains. These outcomes will be achieved through carefully chosen knowledge that students will gain by virtue of expert curriculum design, instruction, inquiry and professional development that will make each student an agent of positive change.

For this purpose the program curriculum will guide the students to become proficient in the following domains:

- Fundamentals: Students will develop their creative intellectual potential by undergoing a thorough grounding in the fundamentals of science, mathematics, computer science, and engineering, and, further, develop their ability to formulate and analyze problems and synthesize well-designed solutions based on this knowledge and their critical judgment.
- Depth and Breadth: Students will develop breadth and depth in disparate areas of Electrical or Computer Engineering and their ability to apply this knowledge to problem solving and designing, building, testing, and validating of Electrical or Computer based systems.
- Flexibility: Students will study in a flexible environment which allows each one the opportunity to pursue individual interests and academic strengths through electives, projects, and internships, and to thereby become accustomed to a sense of flexibility in thinking as they pursue their career.
- Teamwork: Students will be able to work successfully in diverse multi-disciplinary teams with individuals whose expertise spans other engineering disciplines, and in an internship environment with non-engineering disciplines, such as social sciences and business.
- Strategic and Ethical Thinking: Students will develop the ability to think in a sophisticated and ethical manner about technology and their careers, and be encouraged to always question their objectives and be engaged in lifelong learning.
- Systems Building: Students will develop an appreciation for the environment in which engineering is practiced, and will learn to define problems and formulate solutions from a systems perspective.
- Leadership: Students will be encouraged to develop the capacity to lead and become professionals who will evaluate how and why Computer Engineering is practiced and to pursue careers that will help fulfill societal needs.

6.b.III. Curriculum Components

The five-year curriculum for the proposed program is shown on Table II. It consists of 156 credit hours over the five-year span. This number includes the 6-credit Senior Project. The VPAH is a Visual & Performing Arts history elective in one of the areas of: Art History (AH), Studio Art (SA), Theatre (TA), Music (MU), Film (FM), New Media (NM), Radio (RA) or Television (TL).

Summers are left unscheduled so that students may engage in professional development activities. We encourage and help students to get valuable industrial experience. Some students will elect to take additional coursework during the summers in addition to or in lieu of industrial work.

Year	Fall		Cred	Spring		Cred
First Year	MA 145	Calculus I	4	MA 146	Calculus II	4
	PS 15	General Physics I	3	PS 16	General Physics II	3
	PS 15L	General Physics Lab I	1	PS 16L	General Physics Lab II	1
	EG 31	Fundamentals of Eng	3	HI 10	Origins of the Mod. World	3
	PH 101	Intro to Philosophy	3	SW 131	Fund. Of Prog. For Eng.	3
	EN 11	Texts and Contexts I	3	EN 12	Texts and Contexts II	3
	term total	17		term total	17	
Second Year	MA 245	Calculus III	4	MA 321	Ordinary Diff Equations	3
	EE 213	Intro Electric Circuits	3	CD 211	Engr Graphics I	3
	EE 213L	Electric Circuits Lab	1	SCEL	Science Elective	3
	MA 351	Prob & Statistics	3	SCEL	SCEL Lab	1
	GE	General Elective I	3	RS 101	Exploring Religion	3
	SW 232	Adv. Prog. And Data Struct.	3	EC 11	Intro Microeconomics	3
	term total	17		term total	16	
Third Year	MA 231	Discrete Mathematics	3	CR 246	Digital Design II	3
	CR 245	Digital Design I	3	GE	General Elective II	3
	CR 245L	Digital Design Lab I	1	EN	English Elective	3
	CR 331	Biomedical Signal Proc	3	CR 332	Biomedical Imaging	3
	CR 320	Computer Networks	3	EE 346	Embedded Mico Cont.	3
	PH	Phil Elective	3	EE 346L	Embedded Mico Cont. Lab	1
	term total	16		term total	16	
Fourth Year	CR 333	Biomedial Visualization	3	HI	History Elective	3
	CR 390	Senior Project I	3	CR 391	Senior Project II	3
	ECE 415	Numerical Methods	3	SS/EL	Social Science Elective	3
	ECE 420	Reading in ECE	3	ECE	Grad. Maj. Elective	3
	RS EL	Religious Studies Elective	3	AE	Applied Ethics Elective	3
	AH	Art history Elective	3			
	term total	18		term total	15	
Fifth Year	ECE	Grad. Maj. Elective	3	ECE	Grad. Maj. Elective	3
	ECE	Grad. Maj. Elective	3	ECE	Grad. Maj. Elective	3
	ECE	Grad. Maj. Elective	3	ECE	Grad. Maj. Elective	3
	ECE	Grad. Maj. Elective	3	ECE	Grad. Maj. Elective	3
	term total	12		term total	12	
OVERALL TOTALS		156	80			76

Table IIa. The 5-Year ECE MS Program with Computer Engineering BS

Year	Fall		Cred	Spring		Cred
First Year	MA 145	Calculus I	4	MA 146	Calculus II	4
	PS 15	General Physics I	3	PS 16	General Physics II	3
	PS 15L	General Physics Lab I	1	PS 16L	General Physics Lab II	1
	EG 31	Fundamentals of Eng	3	SW 131	Fund. Of Prog. For Eng.	
	PH 101	Intro to Philosophy	3	HI 10	Origins of the Mod. World	3
	EN 11	Texts and Contexts I	3	EN 12	Texts and Contexts II	3
	term total	17		term total	14	
Second Year	MA 245	Calculus III	4	MA 321	Ordinary Diff Equations	3
	EE 213	Intro Electric Circuits	3	EE 221	Freq. Domain Circuit Analysi	3
	EE 213L	Electric Circuits Lab	1	CD 211	Engr Graphics I	3
	MA 351	Probability and Statistics I	3	RS 101	Exploring Religion	3
	CH 111	General Chemistry I	3	HI EL	History Elective	3
	CH 111L	Gen Chem I Lab	1	AH EL	Art History Elective	3
	GE	General Elective	3			
	term total	18		term total	18	
Third Year	ME 201	Statics	3	EE 331	Analog Electronic Design	3
	CR 245	Digital Design I	3	EE 331 L	Analog Electronic Design Lal	1
	CR 245L	Digital Design Lab I	1	MC 300	Feedback & Control Systems	3
	EE 231	Intro. Electronic Circuits	3	PH EL	Philosophy Elective	3
	EE 231L	Electronic Circuits Lab	1	EN	English Elective	3
	EE 301	Systems & Signals I	3	ME EL	Mechanical Engineering Elec	3
	RS EL	Religious Studies Elective	3			
	term total	17		term total	16	
Fourth Year	EC 11	Intro to Microeconomics	3	EG 391	Senior Project II	3
	EG 390	Senior Project I	3	ECE	Grad. Maj. Elective	3
	ECE 415	Numerical Methods	3	GE	General Elective	3
	EE 321	Electromagnetic Fields	4	AE 287	Engineering Ethics	3
	ECE 420	Reading in ECE	3	SS/EL	Social Science Elective	3
	term total	16		term total	15	
Fifth Year	ECE	Grad. Maj. Elective	3	ECE	Grad. Maj. Elective	3
	ECE	Grad. Maj. Elective	3	ECE	Grad. Maj. Elective	3
	ECE	Grad. Maj. Elective	3	ECE	Grad. Maj. Elective	3
	ECE	Grad. Maj. Elective	3	ECE	Grad. Maj. Elective	3
	term total	12		term total	12	
OVERALL TOTALS		155	80			75

Table IIb. The 5-Year ECE MS Program with Electrical Engineering BS

The Senior Design Project I and II, in the 4th year have been joined with graduate courses. The graduate level courses in year 5 include room for the optional thesis. ABET requires a year of math and science, and our students will get a minor in math as well as a minor in biomedical engineering.

All the courses listed in Table II are presently in existence. No new courses need be developed at this point. Syllabi for the courses are available upon request. Syllabi for the courses listed in Table II are available upon request. The course descriptions are included in Appendix A.

6.b.IV. Learning Goals and Required Courses

The courses that provide the knowledge and skills and tools that students need to achieve the program objectives are discussed below.

- CR245/CR245L, CR246, EE346/EE346L: These courses cover the concepts, skills, methodologies, techniques, tools, and perspectives needed by the hardware engineer needed to design and implement computer-based systems.

- SW 131, SW 232, CR320: These courses teach students to develop a thorough understanding of the latest programming languages and tools, related computer science skills. Students learn the essentials of classes, objects, inheritance, and polymorphism. Students also learn to model problems in an object-oriented fashion. Students will achieve an understanding of how object-oriented applications are designed and built. Students learn how computational resources are pooled, shared, and dynamically assigned and reassigned to workload in line with "need" policy, thus creating the opportunity for greater efficiency and agility.
- ECE415, CR331, CR332, CR333: These courses give the students depth into the field of signal processing, imaging, and visualization. The application is in the biomedical device field, emphasizing the role of engineering as a service to society.
- ECE420 gives students the ability to do research, pose a research problem and communicate it to their peers.
- EG390/EG391: These senior project courses are done at the completion of the 4-year program. The student applies their knowledge of computer development by participating in a group project that designs and implements a complete computer system. These courses address the management of the computer development process. Each aspect of the computer design process (requirements gathering, specification, development, design and architecture of computer hardware, coding, testing, documentation and maintenance) is discussed and applied.

7. Administrative Structure and Governance

The program will be administered by the chair of the Computer Engineering department, Dr. Douglas Lyon, with oversight by the Dean of Engineering, and the Dean's Council It will be further assisted by a curriculum advisory group of faculty and industry representatives. Dr. Lyon will be responsible for the day-to-day administration of the program, long-term planning, and internal and external relations, and will report to the Dean.

The Advisory Board of the School of Engineering will also have a hand in assisting the program to maintain communications and interactions with industry for the placement of interns and for prized collaborations in the framework of the Capstone Project courses. The current composition of the SOE Advisory Board is shown in Appendix B.

8. Resources. Resources available and resources needed.

The academic resources needed for the proposed dual-degree five-year program are all available in the SOE, in view of the fact that both the traditional 4-year undergraduate program and the ECE Master's program have been operational for some time. The proposed program is a modification to the existing programs. This modification will leverage the courses and computer and hardware assets already at the disposal of the Computer Engineering program in the SOE. Existing laboratories listed in Table III support all laboratory aspects of the program, from language skills to computer development practices, etc.

8.a. Faculty

The faculty who will teach Electrical and Computer Engineering courses are:

1. Beal, Jack, Professor, Physics; Ph.D., Michigan State University.
2. Botosani, Paul, Adjunct Professor and Director of Laboratories, Electrical Engineering and Automation, Ph.D., Polytechnic Institute of Bucharest.
3. Cavello, James, Adjunct Instructor, MBA Carnegie Mellon.
4. Denenberg, Jeffrey, Adjunct Professor, Electrical Engineering; Ph.D., Illinois Institute of Technology.
5. Govil, Pradeep, Adjunct Assoc. Professor, Electrical Engineering; MSEE, Carnegie Mellon.
6. Lyon, Douglas, Professor and Chairman of the Computer Engineering Department, Ph.D., Rensselaer Polytechnic Institute.
7. Lopes, Gino, Adjunct Instructor, MSECE, Fairfield University
8. Marquis, Maynard, Adjunct Assistant Professor, MSEE, Yale University.
9. Munden, Ryan, Assistant professor, Ph.D., Yale University.
10. Pizzo, Clement, Adjunct Associate Professor, Electrical Engineering; EED, Polytechnic Institute of New York.
11. Talty, Tim, Professor and Chairman of the Electrical Engineering Department; Ph.D., University of Toledo, Ohio.
12. Vagos, Hadjimichael, Professor, Electrical Engineering/Physics; Ph.D., University of California, Berkeley.
13. Weiman, Carl, Adjunct Associate Professor, Computer Engineering; Ph.D., Ohio State University.

These faculty members are sufficient to cover all areas of the ECE curriculum. No other resources are requested for the implementation of the proposed five-year program.

8.b. Laboratories

The School of Engineering has assembled the resources required for the successful implementation of the MSECE program. Furthermore, funding for future equipment replacement to keep pace with advancing technology, and for further programmatic development, is now available. Hence, satisfying the demands of the proposed program will have no adverse impact on other programs.

Dedicated laboratories in SOE are under the supervision of the Director of Laboratories, Dr. Paul Botosani. He is assisted by part time lab assistants. All laboratories are equipped with leading-edge instrumentation. The MS ECE laboratory courses use the equipment listed in Table VI. They are all presently available, and, as indicated already, provisions have been made for their replacement in the future, as needs arise. The domains on the computer engineering side include courses that will be taught in a studio mode – as in the RPI model- and will include hands-on work incorporated into class work.

The SOE classrooms have video projectors with networked computers. Some of the computer engineering classes, e.g., Voice & Signal Processing, need special equipment, e.g., microphones, speakers and sound cards. Those are available and installed. Other resources, currently available also, include scanners, full-color printers, DVD writer and digital cameras for the purposes of the Image Processing course and the Computer Graphics and Computer Animation classes.

Finally, a special robotics studio/lab is available in support of the Network Programming and Embedded Systems courses. The extensive computer resources required for the program are all available.

The laboratory facilities available for the proposed program are listed in Table III.

Table III: Laboratory Equipment Support the ECE Program

Item	Course
Arduino Board	ECE 448L Microcontroller Laboratory
Altera Boards	ECE 406 Advanced Digital Design
Screen Printer	ECE 515L Microelectronics Laboratory ECE 520L Systems Design Laboratory ECE 510L Product Design Laboratory
Programmable Kiln	ECE 515L Microelectronics Laboratory ECE 520L Systems Design Laboratory

	ECE 510L Product Design Laboratory
Electronics Test Equipment	ECE 515L Microelectronics Laboratory ECE 520L Systems Design Laboratory ECE 510L Product Design Laboratory ECE 530L Power Electronics Laboratory ECE525L Communications Laboratory
Instrumentation for temperature coefficient of expansion measurements.	ECE 510L Product Design Laboratory
Instrumentation for thermal capacity measurements.	ECE 510L Product Design Laboratory
Instrumentation for thermal conductivity measurements	ECE 510L Product Design Laboratory
Instrumentation for measurements of mechanical properties of materials (Instron).	ECE 510L Product Design Laboratory
Infrared temperature measurement system	ECE 510L Product Design Laboratory
AC/DC power	ECE 530L Power Electronics Laboratory
Power Transformers	ECE 530L Power Electronics Laboratory
Variable frequency power supply	ECE 530L Power Electronics Laboratory
Electronic Components	ECE 530L Power Electronics Laboratory
Instrumentation for RF measurements.	ECE 525L Communications Laboratory
Instrumentation for Wireless Communications	ECE 525L Communications Laboratory

In conclusion, the needed resources for the successful implementation of the MS ECE program, as detailed in this proposal, have all been assembled. The School of Engineering has as its overarching objective to create an effective learning environment for MS ECE, and all its other programs. It will spare no effort to achieve this objective.

8.c. The SOE Administration

A part-time network administrator provides IT support to the School and centrally administers computer packages. SOE has six dedicated computer laboratories and seven instrumentation laboratories assigned to different engineering tasks (electrical, electronics, robotics, automation, manufacturing, mechanical, materials, power).

8.d. **Computer Inventory**

The list of the most prominent Computer tools that support instruction in the SOE are included in Appendix C.

9. Projections for the Future

The quality and efficacy of the proposed 5-year course of study will be subject to the same *Assessment and Continuous Quality Improvement Process (ACQIP)* in effect in the SOE since

1997. ACQIP is the protocol that allows continuous evaluation of the degree of achievement of program learning goals and program objectives across all academic programs in the SOE.

With all the resources currently on hand, there is no additional expense that need be added to the SOE budget, and no budget for the program modification need be provided at this point.

Appendix A

Master of Science in

Electrical and Computer Engineering

MSSE Course Descriptions

SW 402 Database Concepts
This course focuses on the steps required to build and maintain the database infrastructure for client/server applications. It covers physical design and implementation of the database; the use of the database to meet the informational needs of a client/ server system; and the installation, operation and maintenance of the RDBMS software. Specific topics include structured query language, utilities provided by the vendor, the use of an RDBMS, backup and recovery of data, and security and controls. Students perform a number of hands-on exercises using an RDBMS running on Windows 2000. Microsoft SQL Server or Oracle is the software vehicle for lectures and lab exercises. Three credits.

SW 408 Java for Programmers I
This programming course introduces Java fundamentals. Topics include the Java elements: objects, classes, data types, operators, control structures, and container data structures. The course views object-oriented programming as integral, teaching it throughout. Accordingly, it includes the concepts of encapsulation, inheritance, polymorphism, packages, interfaces, and inner classes. The course teaches screen design using graphical user interfaces and includes data handling concepts such as input from the keyboard, output to the screen, input from files and output to files. The course also introduces the concept of multi-threading in preparation for follow-up studies. Lab included. Three credits.

SW 409 Java for Programmers II
This course covers advanced topic of Java programming. Topic covers multithreading, networking, nested references, design patterns, JDBC, persistence, I/O and advanced GUI such as swing. Data structure concepts such as linked list, tree and basic searching and sorting algorithms will be covered. Lab included. (Prerequisite: SW 408 or permission of the instructor) Three credits.

SW 410 Enterprise Java
Advanced server-side Java technologies. Coverage includes state-of-the-art explorations into serverside technologies such as JDBC, Google Web Toolkit, Enterprise JavaBeans (EJB), Android, XML, etc., as time permits. Lab included. Prerequisite: SW409 or permission of the instructor. Three credits.

MSECE Course Descriptions

Bridge Courses
Required to complete one's preparation for the master's program is strong aptitude in the area of electric circuits, fields and waves, electronic circuits and devices. Students with deficiencies in those areas should confer with the Program Director to create a course of study. (See undergraduate catalog or visit the SOE website for a description.)

ECE 405 Electronic Materials
This course describes the properties and applications of certain materials used in the design and manufacture of electronic assemblies. Ceramics are often used as insulators, heat sinks, and substrates for interconnection structures. The course presents electrical, mechanical, and thermal properties of various ceramics, along with methods of fabricating and machining ceramic structures. Adhesives used to mount components and to replace mechanical fasteners such as screws and rivets provide connections that are stronger and take up less space. The course examines properties of adhesives such as epoxies, silicones, and cyanoacrylates under conditions of high temperature storage and humidity, along with methods of applications. Solders used to interconnect electronic components and assemblies are selected for temperature compatibility, mechanical properties, and reliability. The course emphasizes the new lead-free solder materials and presents the properties of plastic materials and the methods of forming plastic structures. (Prerequisite: EE degree or equivalent) Three credits.

ECE 406 Advanced Digital Design
This course covers modern methods of digital logic design via VHDL (VHSIC Hardware Description Language) and modern design methodology. Programmable Device Architectures are discussed. Targeting both FPGA and CPLD devices, structural, behavioral, and data-flow VHDL models are developed for familiar logic and arithmetic circuits, and state machines. The difference in coding for synthesis and coding for simulation is stressed. Further development of VHDL Language skills is performed in the context of an introduction to Computer Architecture.

Memory and Bus models are discussed. Design projects apply the theory to practical problems. (Prerequisite: CR 245 or permission of the instructor) Three credits.

ECE 407 Fiber Optic Transmission and Communication
This course examines the theory and basic elements of fiber optic communications systems; fundamentals of transmission in optical fibers; source component operations including light emitting diodes and solid-state lasers; and coupling element and detector devices. Students analyze modulation and demodulation techniques and determine overall loop performance relative to bandwidth and signal-to-noise ratio. Design problems enhance student understanding. (Prerequisites: EE 231, EE 301) Three credits.

ECE 407L Fiber Optic Transmission and Communication Laboratory
Students are introduced to fiber optics with experiments on Snell's Law and total internal reflection. Students then use optical test equipment to measure the characteristics and applications of fiber optic cables, including simple communication systems. Fiber optic characteristics may include losses due to transmission, mismatch, and bending, optical fiber connections and splicing, and frequency response. Both in-lab computer assisted instruction and a textbook will be used to supplement the experiments. Students prepare laboratory reports each week on their results. (Co-requisite: ECE 407) One credit.

ECE 410 Voice and Signal Processing
This course supports the signal processing and computer systems domain. It provides an overview of digital audio and its application, and discusses the current state of streaming audio on the Internet and digital audio processing fundamentals. Students apply these theories by creating programs that synthesize and process music and voice. The course exposes students to the elements of multimedia network delivery of audio content. (Prerequisite: SW 408 or permission of the instructor) Three credits.

ECE 415 Engineering Applications of Numerical Methods
This course provides students with the theoretical basis to proceed in future studies. Topics include root-finding, interpolation, linear algebraic systems, numerical integration, numerical solution of ordinary and partial differential equations, modeling, simulation, initial boundary value problems, and two point boundary value problems. (Prerequisite: SW 408 or equivalent demonstrated programming language skills) Three credits.

ECE 420 Readings in Electrical and Computer Engineering
Students formulate a project proposal, perform literature surveys, and learn the finer points of technical writing and presentation at the graduate level. The course requires a meta-paper written about the literature in the field. It emphasizes the basics of technical writing and research, and is organized to emphasize methods of the writing and the research process. Students learn to state a problem, the techniques of analysis, methods of investigation, and functional organization. (Prerequisite: completion of one domain) Three credits.

ECE 425 Thermal Management of Microdevices
This course considers the generation and removal of heat in electronic assemblies. The course describes the sources of heat in an electronic assembly, such as the contribution of the switching speed and the “ON” resistance of field effect transistors at the device level, covers the effects of heat on system reliability analytically, and describes the resulting failure mechanisms in detail. It presents methods of removing heat from electronic circuits, including heat pipes, Peltier effect devices (thermoelectric coolers), and convection, using both gases and fluids to transfer heat, and describes methods of measuring heat, including contact and noncontact methods . (Prerequisite: EE degree or equivalent) Three credits.

ECE 430 Image Processing
This first course in image processing with biomedical applications covers image algebra, arithmetic operations, Boolean operations, matrix operations, achromatic and colored light, selecting intensities, Gamma correction, chromatic color, psychophysics, color models, color space conversion, low-level pattern recognition, as well as video processing, compression and two-dimensional streaming, and multi-resolution multimedia network streaming . This course requires substantial programming effort and emphasis is placed on good software engineering practices. Students write image- processing applications. (Prerequisite: ECE 410 or CR 310 or SW 511 or permission of the instructor) Three credits.

ECE 431 Biomedical Signal Processing
This course presents an overview of different methods used in biomedical signal processing. Signals with bioelectric origin are given special attention and their properties and clinical significance are reviewed. In many cases, the methods used for processing and analyzing biomedical signals are derived from a modeling perspective based on statistical signal descriptions. The purpose of the signal processing methods ranges from reduction of noise and artifacts to extraction of clinically significant features. The course gives each participant the opportunity to study the performance of a method on real, biomedical signals. (Prerequisites: SW 131 or CS 141 or SW 408

and MA 146 or MA 122 or permission of the instructor) Three credits.

ECE 432 Biomedical Imaging
The course presents the fundamentals and applications of common medical imaging techniques, for example: x-ray imaging and computed tomography, nuclear medicine, magnetic resonance imaging, ultrasound, and optical imaging. In addition, as a basis for biomedical imaging, introductory material on general image formation concepts and characteristics are presented, including human visual perception and psychophysics. (Prerequisite: ECE 431) Three credits.

ECE 433 Biomedical Visualization
An introduction to 3D biomedical visualization. Various technologies are introduced include UltraSound, MRI, CAT scans, PET scans, etc. Students will learn about spatial data structures, computational geometry and solid modeling with applications in 3D molecular and anatomical modeling. (Prerequisite: SW 232 or equivalent) Three credits.

ECE 435 Microelectronics
This course considers the methods of interconnecting electronic components at very high circuit densities and describes methods of designing and fabricating multilayer printed circuit boards, co-fired multilayer ceramic substrates, and multilayer thin film substrates in detail. It discusses the methods of depositing thick and thin film materials, along with their properties, and analyzes these structures and compares them for thermal management, high frequency capability, characteristic impedance, cross-coupling of signals, and cost. The course also includes techniques for mounting components to these boards, including wire bonding, flip chip, and tape automated bonding. (Prerequisite: EE degree or equivalent.) Three credits.

ECE 440 Computer Graphics
This course supports the visualization and computer systems domain with computer gaming applications. It is an introduction to GUI and game design and computer graphics concepts. Topics include human-computer interfaces using the AWT; applied geometry homogeneous coordinate transforms. (Prerequisite: SW 408 or permission of the instructor) Three credits.

ECE 441 Computer Systems Architecture
An investigation into computer architectures (past, present and future). We will explore various hardware and software techniques designed to maximize parallelism and improve performance . Front-end design (branch prediction, instruction fetch, trace caches), HW/ SW techniques of parallelism, Memory system design (caching, prefetching), Technology issues (low power, scaling, reliability, nanotechnology), multiprocessors. Class will include a mix of lectures and discussions on assigned readings of recent publications. Students will be responsible for leading and participating in these discussions. A course project exploring a particular topic in depth will be required. (Prerequisite SW 408, CR 245 or permission of instructor) Three credits.

ECE 445 Digital Integrated Circuit Design
This course considers the design and layout of digital integrated circuits. It presents the fabrication, structure, and properties of CMOS devices in detail along with the structure of basic building blocks, such as flipflops and counters, and covers digital circuit design techniques and simulation. Students learn how to lay out digital circuits to incorporate the design requirements. The course also discusses custom integrated circuit specification and design techniques, along with economics. (Prerequisite: CR 245 or equivalent.) Three credits.

ECE 447 Analog Integrated Circuit Design
This course considers the design of CMOS analog integrated circuits. The fabrication, structure, and properties of analog CMOS devices are presented in detail along with the structure of basic building blocks, such as current mirrors and operational amplifiers. Students design and simulate circuits using Spice and lay out analog CMOS circuits using software designed for this purpose. (Prerequisite: EE 331 or equivalent.) Three credits.

ECE 448 Embedded Microcontrollers
Introduction to embedded microcontrollers in electronic and electromechanical systems. Hardware and software design techniques are explored for user and system interfaces, data acquisition and control. These tools are used to develop software code for practical applications such as motor speed control and voltage regulation for power supplies. (Prerequisite: CR 245 or equivalent.) Three credits.

ECE 448L Embedded Microcontroller Laboratory
This laboratory covers the basic operation and applications of a microprocessor. Students learn to program a microprocessor to control applications such as motor speed by the use of an emulator connected to a PC. They

design a circuit using a microprocessor for a specific application and write a program to control the circuit. On completion of the program, they use the emulator to program an actual microprocessor for use in their circuit. (Co-requisite: ECE 448.) One credit.

ECE 450 Computer Animation
This overview of computer animation techniques includes traditional principles of animation, physical simulation, procedural methods, and motion-capture based animation. The course discusses computer science aspects of animation, with lessons ranging from kinematic and dynamic modeling techniques to an exploration of current research topics motion re-targeting, learning movements and behaviors, and video-based modeling and animation. Class projects offer hands-on animation experience. (Prerequisite: ECE 440 or CR 325.) Three credits.

ECE 451 Nanoelectronics I
Building on the two introductory courses in nanotechnology, this course is the first of two that describe how nanotechnology can be integrated into the electronics industry. The unique electrical, mechanical, and optical properties of structures in the nanometer range and how they may be applied to electronics products are discussed. Principles of electronic materials, semiconductor devices, and microfabrication techniques will be extended to the nanoscale. Students will increase their knowledge of electronic structure, quantum mechanics, and the behavior of optoelectronic and low-dimensional systems. Students make extensive use of the available literature to seek out potential applications of nanotechnology. Intended for students interested in the minor in nanotechnology Nanoelectronics track. Also open to interested graduate students in ECE. Lecture course. (Prerequisite: EG 212 or permission of the instructor). Three credits.

ECE 452 Nanoelectronics II
This second course in Nanoelectronics emphasizes present and potential applications of nanotechnology in the various fields of next-generation electronics. The course will discuss topics relevant to electromagnetism at the nanoscale, MEMS/NEMS, nanosensors, nano-optics, molecular electronics, and nanoelectronic interfaces with biology. Student teams will survey the available literature and companies involved in designing and manufacturing devices with Nanoelectronics as a core to select a product for analysis in terms of technical and economic advantages, and present their findings. Teams of students also conceptualize a potential product, and perform the same analysis. Intended for students interested in the minor in nanotechnology Nanoelectronics track . Also open to interested graduate students in ECE. (Prerequisite: ECE 315 /ECE 451). Three credits.

ECE 455 Sensor Design and Application
This course covers the design, fabrication, and properties of sensors intended to measure a variety of parameters, such as stress, temperature, differential pressure, and acceleration. Sensors of different types are used in a wide range of equipment, especially automated equipment, to detect changes in state and to provide the signals necessary to control various functions. Sensors are generally connected to electronics systems that process and distribute the signals. The support electronics must identify the signal, separate it from noise and other interference, and direct it to the appropriate point. These support electronics are a critical part of the sensor technology; students discuss their design and packaging in detail. (Prerequisite: EE degree or equivalent.) Three credits.

ECE 457 Advanced Linear Systems
This course considers the use of Laplace transforms to solve linear systems with multiple time constants and the solution of multiple linear simultaneous equations. The analysis of linear systems usually results in the generation of transfer functions in s, the Laplace transform variable. Particular attention is given to the electrical and mechanical implementation of these transfer functions in linear systems using both analysis and synthesis techniques. (Prerequisite: EE 301 or equivalent.) Three credits

ECE 460 Network Programming
This course covers principles of networking and network programming. Topics include OSI layers, elementary queuing theory, protocol analysis, multithreading, command- line interpreters, and monitors. Students write a distributed computing system and check their performance predictions with experiments. (Prerequisite: SW 232 or equivalent) Three credits.

ECE 461 Special Topics
This course covers special topics and is offered on demand. Students can take this course multiple times, for credit. Topics in electrical and computer engineering will be pre-announced, along with a syllabi. Three credits.

ECE 465 Nonlinear Control Systems
Control systems are used in many industrial applications to control processes or operations and in many non-industrial applications as well. Nonlinear control systems are frequently used in applications where the control variables have a wide dynamic range. Unlike linear systems, the analysis of nonlinear systems rarely results in a

closed-form mathematical expression .This course considers the analysis and applications of nonlinear control systems by numerical and graphical techniques and considers means of implementing the solutions. (Prerequisites: ECE 415 and EE 302 or equivalent.) Three credits.

ECE 470 Network Embedded Systems
This course covers distributed development connecting peripherals to networks via Java. Plug-and-play paradigm is used to add services on the fly. Students learn about the following topics: multicast and unicast protocols, service leasing, lookup services, remote events, sharing data between distributed processes, and distributed transactions. The course also covers interfacing hardware (sensors, robotics, etc.) to the Web. (Prerequisite: SW 408.) Three credits.

ECE 475 Microwave Structures I
This course considers the analysis and design of structures used in microwave transmission and reception. The course covers distributed parameters in detail, leading to a discussion of the properties of transmission lines. It presents the utilization of distributed parameter structures to design filters, couplers, and mixers, along with methods of implementation. Also included are strip line and microstrip transmission lines and filters. The course discusses microwave devices, both Si and GaAs, including low-power and high-power devices and laser diodes. (Prerequisite: EE 321 or equivalent.) Three credits.

ECE 476 Microwave Structures II
This course is a continuation of ECE 475 and covers the design and analysis of microwave amplifiers, oscillators and mixers, frequency multipliers, and antennas. The course begins by presenting electrical models of RF components and relating those models to design methods. The effects of internal and external noise are considered in the models. Practical applications and design are emphasized. (Prerequisite: ECE 475). Three credits.

ECE 480 Wireless Systems I
The applications of wireless communication are expanding rapidly from cellular phones to wireless internet to household appliances and involve many disciplines other than microwave transmission. This course covers several aspects of wireless communication, including antenna design, FCC regulations, and multi-channel transmission protocols. In addition, it discusses modern design approaches such as Bluetooth. Students learn how analog and digital signals are coded. The course also discusses transmission during interference and EMI/RFI as well as fiber optics communication. (Prerequisite: EE 321 or equivalent.) Three credits.

ECE 481 Wireless Systems II
This is a continuation of ECE 480. The topics to be covered include diversity, coding, multiple antennas, and equalization. Modern applications requiring Multicarrier Modulation and Spread Spectrum techniques are also discussed. The course concludes with an examination of 3G and 4G methods and applications. Prerequisite: ECE 480. Three credits.

ECE 483 Independent Study
Students pursue special topics, projects, and/or readings in selected areas. Students must meet with the instructor to discuss the proposed topic of study. (Prerequisite: Permission of the instructor.) Three credits.

ECE 485 Digital Communications
This course is designed to explore current digital communications features, including network communications between computers. It includes discrete time signals and systems, Z-transforms, discrete Fourier transforms, fast Fourier transforms, digital filter design, and random signals. Fundamentals of sampling principles and channel coding are utilized to develop common baseband and digital modulation techniques (ASK, FSK, PSK, PCM, and delta modulation). Transmission over bandwidth constrained channels, and signal detection and extraction. Multiplexing and multiple access networks are also analyzed. The lecture material is illustrated with practical examples. (Prerequisite: EE 301 or equivalent.) Three credits.

ECE 490 Analog Communication Systems
The course focuses on analog communication systems and the effects of noise on those systems, developing modulation and demodulation techniques (amplitude, frequency, and phase modulation and pulse code) . It discusses dealing with non-linear system elements and presents a mathematical treatment of the effects of various noise sources on these systems. Historical design studies and topics in communication applications permit students to apply these concepts to meet system requirements. The course clarifies important concepts through simulation of modulation techniques on multimedia computing systems. (Prerequisite: EE301) Three credits.

ECE 495 Power Generation and Distribution
This course considers the generation and distribution of electrical power to large areas. Three-phase networks are described in detail, including both generators and loads. Methods of modeling distribution systems by per-unit

parameters are covered, along with power factor correction methods . Fault detection and lightning protection methods are also described. Some economic aspects of power generation and distribution are presented. (Prerequisite: EE degree or permission of instructor.) Three credits.

ECE 496 Fault Analysis in Power Systems
This course covers three types of faults in electrical power grids: open lines, lines shorted to ground, and lines shorted to each other. Methods of locating faults are covered, along with an analysis of the effects. Methods of protection and fault isolation are also covered. (Prerequisite: ECE 495.) Three credits.

ECE 505 Advanced Power Electronics
This course considers the design and application of electronic circuits related to power generation and conversion including inverters, power supplies, and motor controls. Topics include AC-DC, DC-DC, DC-AC, AC-AC converters, resonant converters, and the design of magnetic components. Models of electric motors and generators are presented to facilitate the design of controls for these structures. (Prerequisite: EE331 or equivalent.) Three credits.

ECE 510L Product Design Laboratory
This laboratory course provides hands-on experience in measuring and analyzing the electrical and mechanical properties of materials used in the design of electronic products . It also covers thermal analysis and methods of removing the heat from electronic circuits. Experiential learning includes measurement of temperature coefficient of expansion, measurement of thermal resistance, measurement of tensile strength, measurement of material hardness, temperature measurement of electronic components, Peltier effect (thermoelectric coolers), heat pipes, convection cooling (fins and air flow), and heat flow across a bonding interface such as solder or epoxy. (Prerequisite: ECE 405 or equivalent.) One credit.

ECE 515L Microelectronics Laboratory
This laboratory provides students with an understanding of the processes used to fabricate thick and thin film circuits. As part of their experiential learning, students sputter several materials onto a ceramic substrate and investigate the properties of the sputtered film, such as resistivity and adhesion. Students screen print thick film materials, including conductors, resistors, and insulators onto a ceramic substrate and fire them at an elevated temperature, and investigate the properties of the fired film, plot the distribution of resistor values, and apply statistical methods to determine design curves. Students solder components to the substrates to complete a circuit and analyze the properties of the finished circuit. (Corequisite: ECE 435.) One credit.

ECE 520L System Design Laboratory
This laboratory provides students with an understanding of sensors and non-linear control systems. Experiments include temperature sensors such as thermocouples, thermistors, and infrared, motion sensors, strain gauges, nonlinear servos, and computer analysis of nonlinear systems. (Corequisite ECE455 or equivalent.) One credit.

ECE 525L Communications Systems Laboratory
In this laboratory, students acquire hands-on experience with waveguides, transmission lines, and antennas. They learn how to characterize these structures at microwave frequencies and examine how they affect transmission. They set up prototype wireless transmission systems and transmit and receive analog and digital systems. They analyze the data for integrity and accuracy of transmission. Experiential learning includes measurement of characteristic impedance of transmission lines, simple antenna design (students construct simple antennas and determine the effect of the design on directionality and other parameters), and wireless concepts (students build a wireless communications system and send data back and forth, one-way and two-way; this can be a capstone project involving teams to design and analyze various aspects). (Prerequisite: ECE 476 or equivalent.) One credit.

ECE 530L Power Electronics Laboratory
This laboratory provides hands-on experience in analyzing and designing power electronics circuits and in analyzing and modeling power generation and distribution systems. Students design and construct voltage regulators, switching power supplies, and motor controllers. Students also develop circuit models for AC and DC motors and power transformers. Experiential learning includes developing circuit models for power distribution systems, measuring parameters of motors and transformers and using the data to develop electrical circuit models of these devices, and analyzing the properties of power distribution systems and developing computer models for them. (Corequisite: ECE 505 or equivalent.) One credit.

ECE 550, ECE 551 Thesis I, II
The master’s thesis tests students’ abilities to formulate a problem, solve it, and communicate the results. The thesis is supervised on an individual basis. A thesis involves the ability to gather information, examine it critically, think creatively, organize effectively, and write convincingly; it is a project that permits students to demonstrate skills that are basic to academic and industry work. The student must also submit a paper for possible inclusion in a

refereed journal appropriate to the topic. (Prerequisite: ECE 420.) Six credits

Appendix B

ADVISORY BOARD
Joseph M. Carbone
President & CEO,
Workplace, Inc. Bridgeport, Conn

Gerald V. Cavallo
President,
James Ippolito & Co Bridgeport, Conn.

Anthony N. Fischetti
Director, Engr/Exec. Program Manager
Northrop Grumman Corp Norwalk, Conn.

Dr. Michael J. Hartnett
President & CEO
RBC Bearings Oxford, Conn.

Joseph Ianniello
Bridgeport, Conn.

Paul M. Kelley
Corporate Vice President
Alinabal, Inc. Milford, Conn.

John LaViola
Vice President Engineering
Hologic Inc. Danbury, Conn.

Mark F. Miller
Vice President, Research & Engineering
Sikorsky Aircraft Stratford, Conn.

Patrick F. O'Keefe
VP Engineering & Mfg
O'Keefe Controls Co Monroe, Conn.

Timothy K. O'Neil
VP, Program Management
ASML, Inc. New Milford, Conn.

Jeffrey M. Post
Managing Partner
Trillian Capital Management LLC Shelton, Conn.

Manny Ratafia
CEO
Ratafia Ventures Woodbridge, Conn

Richard J. Reed
Vice President, Engr & Project Excellence
United Illuminating Co, Shelton, Conn

Dr. Mitchell D. Smooke
Strathcona Professor of Mechanical Engineering
Yale University New Haven, Conn.

Robert Sobolewski
President

ebm-papst Inc. Farmington, Conn

Appendix C

Equipment Inventory

Equipments	Quantity	MFG	Model #	Location	Courses
Beamsplitter cube	1	Newport	FK-BSC	BNW 144	Optics
Boards	10	Altera		Storage	Digital
Camera	1	Logitex	Carll	Storage	Voice and Image Processing
Camera	4	TRENDNET	TV-IP100	Storage	Voice and Image Processing
Connectors	31	data System		MCA 203	Networking
Decade Capacitor	1	Cornell	CDB5	BNW 133	All labs
Decade Capacitor	2		CDB3	Storage	All Labs
Demo Board	10	Microcip	PICDEM4	Storage	Digital
Detector	1	Newport	Fk-Det	BNW 133	Optics
Digital Cards Set	1	Nida		MCA 112	Digital
Digital Circuits	3	Digilab	XCRP	Storage	Digital
Digital Circuits	23	Digilab	Spartan 3	Storage	Digital
Digital Circuits	4	Digialb	2E	Storage	Digital
Directional coupler	1	Newport	F-506B	BNW 144	Optics
Fiber, 100/140 mm, 50 m	1	Newport	F-MLD-50	BNW 144	Optics
Fiber, 100/140 mm, 500m	2 1/3	Newport	F-MLD-500	BNW 144	Optics
Fiber, 4/125 SM, 20m	2	Newport	F-SV-20	BNW 144	Optics
FILTER ASSY,SPATIAL	1	Newport	900	BNW 144	Optics
Glass Transducer	2	Newport	FK-GT	BNW 133	Optics
GRIN lens fiber coupler	3	Newport	F-925	BNW 144	Optics
ILD-LED Driver	1	Newport	FK-DRV	BNW 133	Optics
In-line -adapter	5	Newport	F-CA-001	BNW 133	Optics
Laser HeNe	1	Newport	U-1301P	BNW 144	Optics
Laser Mount	1	Newport	807	BNW 144	Optics
Lego Robotics	10	LEGO	Robotics	Storage	Voice and Image Processing
Light Emitter diode	1	Newport	FK-LED	BNW 133	Optics
Mode Scrambler	1	Newport	FM-1	BNW 144	Optics
Polishing Fixture	1	Newport	F-TKP1	BNW 144	Optics
Post Holder	1	Newport	VPH-6	BNW 144	Optics
Quam Boards	1	Feedback		MCA 112	Telecommunication
Rotation Stage	1	Newport	RSX-20	BNW 144	Optics
Serial Towers	8	Lego		Storage	Voice and Image Processing
Sheet polarizer	1	Newport	FK-Pol	BNW 144	Optics
SMF coupler, w/o lens	1	Newport	F-916	BNW 144	Optics
Splice Fixtures	2	Newport	F-SK-SA	BNW 144	Optics
Switch	5	Cysco	2501	MCA 112	Network

Switch	2	Catalyst	1900	MCA 112	Network

1

Appendix D

Thesis students and Publications

ECE Thesis students:

1. Francisco Castellanos MS Thesis
2. Pawel Krepsztul MS Thesis
3. Nishanth Vincent MS Thesis
4. Ian Reddy MS Thesis
5. Bob Distinti MS Thesis
6. Gino Lopes' MS Thesis

Student Publications (In addition to the above listed students, Asmus, Rowland and Linn were MS students in the School of Engineering at Fairfield University):

a. [Lyon 09A] “Interactive Face Recognition”, by Douglas A. Lyon and Nishanth Vincent, Journal of Object Technology, vol. 8, no. 1, January-February 2009, pp. 23-53

b. [Lyon et Al. 06G] "The Initium RJS Screensaver: Part4, Automatic Deployment", by Douglas A. Lyon and Francisco Castellanos, in Journal of Object Technology, vol. 5, no. 8, November-December 2006, pp. 31-40.

c. [Lyon et Al. 06F] "A Macintosh Screensaver in Java : Prt3", by Douglas A. Lyon Pawel Krepsztul and Francisco Castellanos, Journal of Object Technology, vol. 5, no. 7, September-October 2006, pp. 9-17.: Typos

d. [Lyon et Al. 06E] "The Initium RJS Screensaver: Part2, UNIX", by Douglas A. Lyon and Francisco Castellanos, Journal of Object Technology, vol. 5, no. 5, July-August 2006, pp. 7-15.

e. [Lyon et Al. 06D] "The Initium RJS Screensaver: Part1, MS Windows" by Douglas A. Lyon and Francisco Castellanos, Journal of Object Technology, vol. 5, no. 4, May-June 2006, pp. 7-16.

f. [Lyon et Al. 06C] "Remote Job Submission Security " by Pawel Krepstzul and Douglas A. Lyon, Journal of Object Technology, vol. 5, no. 1, January-February 2006, pp. 13-29.

g. [Lyon et Al. 06B] "The JBoss Integration Plug-in for IntelliJ IDEA, Part 4" by Douglas Lyon, Martin Fuhrer, Thomas Rowland, Journal of Object Technology, vol. 4, no. 9, November-December 2005, pp. 11-21.

h. [Lyon et Al. 06A] "JBoss Integration Plugin for Intellibj Idea, Part 3" by Douglas A. Lyon and Francisco Castellanos, Journal of Object Technology, vol. 5, no. 2, March-April 2006, pp. 13-26.

i. [Lyon et Al. 05E] "The JBoss Integration Plug-in for IntelliJ IDEA, Part 2" by Douglas Lyon, Martin Fuhrer, Thomas Rowland, Journal of Object Technology, vol. 4, no. 7, September-October 2005, pp. 25-34.

j. [Lyon et Al. 05D] "The JBoss Integration Plug-in for IntelliJ IDEA, Part 1" by Douglas Lyon, Martin Fuhrer, Thomas Rowland, Journal of Object Technology, vol. 4, no. 5, July-August 2005, pp. 7-17.

k. [Lyon 04] *Java for Programmers*, Prentice Hall, 2004. Book Chapter 33 “More XML Techniques” by Tom Rowland, pp. 557.

l. [Lyon 04] *Java for Programmers*, Prentice Hall, 2004. Book Chapter 34 “Bean Properties” by Diane Asmus, Douglas Lyon, Carl Weiman, pp. 583.

m.[Lyon 04] *Java for Programmers*, Prentice Hall, 2004. Book Chapter 35 “Introspection” by Diane Asmus and Douglas Lyon, pp. 592.

n. [Lyon 04] *Java for Programmers*, Prentice Hall, 2004. Book Chapter 36 “FeatureDescriptors” by Diane Asmus and Douglas Lyon, pp. 597.

o. [Lyon 04] *Java for Programmers*, Prentice Hall, 2004. Book Chapters 37-43 “Introduction to Enterprise Java Beans” by James Linn, pp. 597-683.

Appendix E

Deans' Council Meeting Minutes

October 23, 2012

(NOTE: THE PART OF THE MINUTES RELEVANT TO THE 5YP IS IN *ITALICS)*

Members present: Jack Beal, Doug Lyon, Etemad Shahrokh, Harvey Hoffman, Paul Botosani, Tim Talty, and Wook-Sung (WS) Yoo

Members excused: Bill Taylor

Previous Meeting Minutes (9/25/2012, 10/9/2012) Approved

Announcement by Dean

Major and Minor Info session on campus

Shannon and Ryan will attend the session representing SOE on Thursday (Oct. 25)

Engineering Open House

Combined with students and their family/friends, 102 people are expected to attend the Engineering Open House on coming Nov. 2 (Friday), 10 AM - 1:30 PM at Kelly center.

Jack asked chairs to invite several current students to the open house and prepare 10 - 15 minutes presentation per program avoiding duplicated information. WS asked for the collaboration among presenters and the presentation sequence. Jack will send PPT slides by the end of weekend. Doug asked for slogan and Jack suggested "Carrier Ready" with employment statistics. Harvey shared his conversation with students in campus tour and suggested to highlight the strength of SOE as (1) Small class, (2) No teaching assistant, (3) Location near NYC, (4) Beautiful campus, and (5) Flexibility of the program to change major. Paul added the state of art of Software/Hardware equipment, 24 hour access to lab, and the flexibility among departments in SOE as additional strength to highlight at the open house.

Grad Info Session

Grad info session is scheduled at Kelly Center on Nov. 7 (Wed) between 5:30 – 7 PM.

Undergraduate advising

Undergraduate advising will start from next week. Printed Spring schedule is not available at this time but the course information can be accessed through online.

Internship in City of Bridgeport

Jack distributed the list of possible internships at City of Bridgeport through a new internship initiative with Fairfield University. The internship runs as credited coursework. WS attended the kickoff luncheon for this internship initiative on Friday, Oct. 19 in the Bellarmine Hall and shared the City's interest in possible Capstone projects.

Alumni Survey and Advertisement of SOE

Doug shared CE program's Alumni survey and its format created by using *SurveyMonkey*. Alumni office and

Lorraine have some alumni information but there are many missing/outdated data such as phone number and addresses and raised an issue of how to find updated information of alumni. Doug mentioned the cost ($2200) of getting mailing list from IEEE for all ECE alumni and discussed about adding Fairfield University to local engineering society mailing list (ASME/ASW/IEEE Computer Society, Society of Women Engineering, etc) for broader exposure. Fairfield University is in Google Adword, but not School of Engineering.

Shah suggested to gather alumni information through Facebook/LinedIn. Harvey questioned about paying LinkedIn to search in Database to find alumni information or hire a work study student to find information through social media. Tim received an offer of free trial period of searching information in the database of social network company. Regular monthly fee could be $90/month with some limit in the number of queries. Jack decided to investigate it more with Tim and will also ask Lorraine to provide current alumni list to Doug and other chairs.

Undergraduate Curriculum Committee

Jack and Doug reported that University Curriculum Committee unanimously approved the 5-Year BS/MS Dual Degree program in Computer Engineering department with very minor correction at its June meeting in 2012. Educational Planning Committee will meet on Nov. 15 and Academic Council will meet in Dec. 2012 or Jan 2013 for further action.

The UCC committee reviewed the curriculum. Shah questioned about the tuition of 5 year program how it applied. WS confirmed that students in the program pay tuition based on the number of credits taken as part-time, not paying full $50K. More discussion was made including the number of required credits and thesis option. The 5 year program of CE department was unanimously approved by the committee.

Intellectual Property Policy

Doug raised an issue on IP policy of University at the last meeting. The policy stated any IP related to projects that faculty involved (ex. capstone projects) belonged to University, not to student inventors. Any innovation through Business Competition is also owned by University. After working with University Lawyer and administration office, a revised IP policy was developed and Doug brought it to the committee. It was reviewed and approved unanimously by the committee.

Meeting Adjourned at 5:10 PM. Next meeting will be on November 13, 2012.

Appendix F

UNDERGRADUATE CURRICULUM COMMITTEE MEETING

Minutes of the meeting of October 02, 2012 (RELEVANT PORTIONS ARE IN ITALICS)

Approved November 06, 2012

Attending: Professors Mousumi Bose Godbole, Bruce Bradford, Shah Etemad, Anita Fernandez, Johanna Garvey, Alison Kris, Scott Lacy, Larry Miners, Rajasree Rajamma, Shanon Reckinger, Vin Rosivach, Giovanni Ruffini (Chair), Yohuru Williams, Tommy Xie, SVPAA Paul Fitzgerald, Deans: Jack Beal, Robbin Crabtree, Don Gibson.

Guests: Dean Perkus, Professors: Doug Lyon, Tim Talty

The meeting was called to order by the Chair at 3:32 pm.

1. **Appointment of the secretary *pro tem***: Prof. Rajamma was appointed.

2. Approval of the minutes of May 1, 2012: Prof. Fernandez moved to approve the minutes seconded by Prof. Garvey. Three amendments were suggested: (1) Prof. Rajamma's name to be corrected in the list of attendees (2) Prof. Gibson's name to be deleted from the list as he was not present during the meeting (3) the spelling of 'disciplines' to be corrected on page 2, para # 3. The minutes were approved with corrections by all voting members, except one abstention.

3. Core outcomes assessment (report from the sub-committee):

Chair called Dean Perkus to report on the core outcomes assessment. Dean Perkus distributed a handout containing the timeline for core course review guidelines. He explained that the formulation of the goals and outcomes were done at the departmental level. Six departments (in A&S) have both goals and outcomes. This was followed by a discussion on the report.

In responding to the question by Profs. Miners and Ruffini, regarding the role of the UCC in this matter, Dean Perkus explained that the UCC could approve it as it is.

Prof. Kris: Some of the goals and outcomes are a little pre-mature. Can these goals be communicated back to the departments so that there is commonality in setting the goals among the departments?

Dean Perkus: Some departments (e.g., English) were not comfortable having a limited number of outcomes for the courses. There is some pedagogical resistance to this idea.

Dean Perkus: Mathematics is still working on their goals. As for Visual & Performing Arts, the department head is uncomfortable as the ownership will be taken away from the department.

Dean Crabtree: Our core is in areas not departments. In some cases, the core maps to departments where as in others, they map to group of depts. Based on that, the departments in each area will have to work with other departments in the core area to come up with a common set of goals.

Dean Perkus: There is a core reviewing unit for each core area. So, the document itself understands the need for co-operation among the departments. Except for English no one has expressed any concern regarding this.

Prof. Rosivach moved to reorder agenda for the committee to take up item 4b as the representatives from the school of engineering were waiting to present their case. The motion was seconded by Prof. Miners. Motion was approved unanimously.

4. School of Engineering. Program changes:

Profs: Lyons and Talty were introduced by Prof. Beal. Prof. Beal explained the rationale behind the school's decision to offer a dual degree program by combining the BS and MS program into a 5 year program. Prof. Lyons added that the students will have the option of getting a B.S. in Computer Engineering or a B.S. in Electrical Engineering with an M.S.in ECE. He explained the program structure for the proposed program.

This was followed by questions from the attendees:

Prof. Miners: Can students end the program with a BS if they want?

Prof. Lyons: Yes. They don't have to wait all the 5 years to get the degree.

Answering Prof. Rosivach's question regarding the curriculum requirements, Prof. Lyons said that there are some ABET [accreditation] requirements. With the current programming, we will exceed 48 credit hour requirement for graduation. There is still a large liberal arts core. That has not been diluted.

Prof. Lyons said that the students can enter the program in their junior year.

SVPAA Fitzgerald asked for an explanation regarding the use of summers and inter-sessions in the proposed program. Is this something that international students would understand and appreciate? International students cannot work during summer. So, it may be attractive to offer core courses during summers.

Prof. Lyons: There is a summer internship (see page 11 of the handout) between the 3rd and 4th year. If they are not U.S. citizens, then there may be restrictions. In order not to delay graduation, we would encourage them to take summer classes. But otherwise, summers are free. International students do understand the concept.

Prof. Miners: Is it a popular program?

Prof. Lyons: There are several schools offering this. We are searching for new business models for increasing our enrollment. This seems to work well for software engineering. So, we are following on their lead.

Prof. Bose Godbole: When can they declare their intention to do the masters degree?

Prof. Lyons: They should at least complete 6 courses. Others can do it in the junior year (see page # 9). There is a GPA restriction too.

Prof. Fernandez inquired regarding the thesis requirement in the proposed program. Prof. Lyons responded that at the graduate level, a thesis is increasingly becoming optional.

Following this discussion, Prof. Ruffini requested the committee to consider the second proposal from the SOE.

Prof. Beal presented the second proposal from School of Engineering: ***To phase out, over a two year period, the awarding of the Associate of Engineering Degree by the School of Engineering****. The degree would not be offered beyond May 2014. He also offered the rationale for ending the Associate of Engineering degree. He said that Fairfield University does not advertise these programs currently. Fairfield is competing with the community colleges who are our partners for prospective associate degree students. Only part time students are there in the associate program currently. All of them are also enrolled in the bachelors program.*

Prof. Miners: Any relationship between the associate degree and 3/2 program?

Prof. Beal: No.

Prof. Rosivach: When BEI was initially instituted, it was an important goal for SOE.

Prof.Beal: The original objective has disappeared. Now, we have a day program. We don't believe that having the associate degree is part of our mission now.

Dean Crabtree: How will this affect scheduling the evening programs?

Prof. Beal: We do not see any significant changes.

Prof.Williams: Are we encouraging the students to go to Community college?

Prof. Beal: No, we don't promote it.

Hearing no further questions, Profs. Lyon and Talty were allowed to leave.

Prof. Kris moved to accept the motion that: ***the UCC approve the proposal that the School of Engineering (SOE) create a new degree structure in Electrical and Computer Engineering (ECE), a dual-degree 5-year BS/MS course of study, by combining the curricula for the BS degree and the Master of Science degree in this discipline.*** *The motion was seconded by Prof. Bradford.*

Prof. Kris spoke in support of the motion. SVPAA Fitzgerald also spoke supporting the motion saying that the new program does not require any further resources. Further, the 5 yr programs are becoming very popular at Fairfield (e.g., accounting). We will have to consider how to promote these programs internationally.

Dean Crabtree spoke on how the core curriculum was integrated into the new program. Math, Natural science, English and Ph 10 are there. Generally, core is mapped well in the program. She pointed out that the arts and science faculty are very sensitive to having the foundational courses being taken later in the academic career. In the current programming, 5 core courses have been saved for the final year so that way students will be in the core classes in their junior and senior year.

Prof. Beal agreed with Prof. Crabtree. Students are pretty loaded in the senior year. But we deliberately want the Applied Ethics course to be taken in the senior year.

Prof. Beal pointed out that the international students usually come with a 3 year equivalent program.

Prof. Crabtree said that one of the developments in international markets is the development of liberal arts colleges. At Fairfield, international students will be able to take core classes.

The motion passed unanimously with 13 votes in favor.

Prof. Williams moved to accept the second motion from School of Engineering that **the School of Engineering be permitted to phase out, over a two year period, the awarding of the Associate of Engineering Degree by the School of Engineering.** Prof. Miners seconded the motion.

During the discussion that followed, Dean Crabtree pointed out that A & S closed the associate degree.

Hearing no further discussion, Prof. Ruffini called for a vote on the motion. The motion passed unanimously with 13 votes in favor.

5. Prof. Ruffini brought up the question of what to do with regard to **the core outcomes assessment.** He pointed out that the UCC has three options: (1) we can move to approve the rubric as submitted (2) wait or (3) do nothing. To this, Prof. Miners moved that the issue should be send back to the sub-committee and ask all the departments for greater uniformity in setting their goals and objectives. This was seconded by the Prof. Lacy.

Discussion of the motion followed with Prof. Rosivach stating that this can be done by a subcommittee. SVPAA Fitzgerald said that it would be good idea to send the whole document to the departments so that the departments can see what good goals and objectives are so that they can learn from their peers. Prof. Crabtree also spoke in favor of the motion.

Motion passed unanimously with 1 abstention.

Prof. Rosivach moved to create a core-outcome sub-committee which was seconded by Prof. Miners. Prof. Miners suggested that the sub-committee should be constituted of people outside of A&S.

Motion: Continue with the subcommittee with members from outside of A& S. The motion carried with 11 attendees in favor and 2 abstentions.

The following people nominated themselves for the sub-committee: Profs. Williams, Xie, Miners, Bradford, Etemad. Dean Perkus was nominated by Dean Crabtree. The team will also check with Prof. Kathy Nantz if she is interested in joining the sub-committee.

6. **Report on the status of the US diversity revised language:** The Chair suggested that since the UCC has not received any further interest from AC regarding the matter, the matter be dropped until the US diversity committee comes back to the UCC with a revised proposal. All the members agreed to this.

Dean Crabtree suggested that the respective committees be asked for an update on the revised requirements for the World and U.S diversity requirements.

7. **Examination of final exam policy- Report from the sub-committee**:

A concern was raised from the floor that the memo detailing the sub-committee's suggestion was not distributed before the meeting for the members to give adequate thought to the proposal.

Prof. Etemad reported on the sub-committee's findings, a summary of which was also circulated during the meeting. Following a few clarification questions, a motion was made to table the item until the next meeting and to re-order the agenda to take up item 4C (joint Sociology/ Anthropology major). The motion passed with 8 votes in favor and 3 abstentions.

8. **Joint Sociology/ Anthropology joint major:**

Prof. Lacy offered the rationale behind the joint major. This was followed by a question and answer session where, in response to Profs. Kris, Miners, Rajamma, Rosivach, and Williams, Prof. Lacy explained that the new joint major does not require any new resources; the sociology major is not getting closed, nor will it be cannibalized by the new major; the sociology department has reached out to several outside departments and they are willing to offer the required classes that will fulfill the new major. Prof. Lacy also pointed out that his department is also looking for collaboration with other departments to offer Medical Anthropology and Bio-anthropology which can embolden our health sciences offerings.

Hearing no further questions regarding the topic, a motion was made by Prof. Williams and seconded by Prof. Bradford:

Motion: T**he UCC approve the creation of a joint Sociology / Anthropology major**:

Prof. Crabtree spoke in favor of the motion.

The motion passed unanimously with 11 votes in favor; no abstentions.

9. **Permanent disposition of University College slot on the UCC:**

The motion under discussion was: **that the UCC recommend to the Academic Council that the University College seat on the UCC be retained as a regular seat for a voting representative to be appointed by the SVPAA on an annual basis to represent the interests of part-time undergraduate students.**

Prof. Crabtree pointed out that it will be good to maintain the position as we are still dealing with part-time students, online students and EPC. Prof. Rosivach said that since this is a handbook amendment, the request has to come from the schools. But since we do not have a UC, there is nobody who has experience with the PT students to represent their interest.

Prof. Rosivach moved to table the motion until the next meeting. The motion passed unanimously with 11 votes in favor.

This was followed by a motion to adjourn by Prof. Kris and seconded by Prof. Bradford.

The meeting was adjourned at 5:04 pm.

Respectfully Submitted,

Rajasree K. Rajamma

Appendix G.

Minutes of the Educational Planning Committee (Draft) NOTE: The Relevant Part is in *ITALICS*.

Draft EPC Minutes

November 15, 2012Present: Lynn Babington, Peter Bayers, Paul Fitzgerald, Sheila Grossman, Olivia Harriott, Evagelia Bilias Lolis, Mark Scalese, Carl Scheraga, Christopher Staecker

Absent: Catherine Giapponi, Susan Franzosa, Qin Zhang

Item 1 Review of the Minutes from 10/18/12 Meeting

Professor Grossman made a motion to approve the minutes. Professor Staecker seconded the motion. The committee unanimously approved [except for one abstention] the minutes.

Item 2 Proposal for Sociology/Anthropology Major

Professor Scott Lacy described a brief review of the proposed joint major in sociology and anthropology. The idea came from a 2009 External Review which recommended this joint major from a department that offers a sociology major, sociology minor, and anthropology minor. The six required courses would be split in each area with majors taking an introductory, theory, and methods course in each discipline along with four electives from the two areas. Professor Lacy explained the multiple advantages for students who avail themselves of this major. Professor Harriet reinforced the importance of having a medical anthropology course and the many benefits this would allow for collaboration with other departments in the university. Professor Lacy described that the Anthropology 110 course, which has recently been opened as a core science course, is being taught by an adjunct anthropologist and is very popular. Professor Bayers suggested that the new major would prepare students for graduate programs and be good for preparing students' careers. Professors Lacy and Scheraga discussed the benefits of Sociology & Anthropology collaborating with various departments in providing courses on cross cultural communication methods and the need for more graduates with these skills. SVPAA Fitzgerald described the results of an alumni poll and suggested that students majoring in this newly proposed major would most likely obtain a job after graduation, that the major might be a good foundation for pre law, and also that the major serves as a mechanism to fulfill the university and department's mission. Professor Bilias Lolis agreed it was an excellent idea and would positively impact the whole university. Professor Lacy suggested high potential growth and would hope a medical anthropologist faculty could be hired in the future. Dean Babington agreed that there would be many collaborations between departments regarding medical anthropology such as with nursing and communication. Professor Scalese suggested collaboration between his department and sociology & anthropology regarding ethnographic filming. Professor Lacy explained that he is trained in video anthropology by the NSF and agreed on this potential collaborative.

Professor Scalese made a motion to approve the proposal for the joint major and Professor Harriet seconded. The motion passed unanimously.

Item 3: School of Engineering Proposals A. Phase Out of Associate of Engineering Degree

Dean Jack Beal discussed the history of associate degree engineering programs and BEI's mission of preparing engineering technicians in the past. The School of Engineering wants to concentrate on offering comprehensive educations programs and allow the various community colleges to prepare students via the associate degree. Currently the university and the School of Engineering has agreements with six community colleges to accept transfers. There are only two students in the AD program presently and this proposal will close the AD program over the next two years but allow the two current students to graduate.

B. Dual Degree Program: MSc in Electrical and Computer Engineering

Professor Doug Lyons described the proposed 5 year BS/MS program in electrical and computer engineering. The curricula for the two areas would be combined and graduates would be awarded a BS in Computer or Electrical Engineering with an MS in Electrical and Computer Engineering. Professor Lyons explained the demand for this combined degree is high and shared how other universities are successfully offering it. It is a very financially attractive solution to engineering students who are seeking jobs requiring more than the baccalaureate preparation. Both students and parents are asking for this program. The 5 year dual program in Software Engineering has shown positive growth.

SVPAA Fitzgerald asked if students would have to overload during the BS program and decide immediately in freshman year if they want this program in order to accomplish the goals of the dual program. Professor Lyons said some semesters have 18 credits but the first year is identical for the 4 and 5 year program so it would behoove the student to decide if they wanted this dual program early on but not immediately as freshmen in the BS program. Professor Grossman suggested that since summers and intersessions are not course assigned, students could lighten their 18 credit load by taking courses then along with their internships. Professor Staecker compared the proposed program to the 5 year accounting BS/MS program which has been successful. Dean Babington asked if the proposed program was similar to competitors' programs. Professor Lyons agreed it was and that the dual bachelor and masters degree programs seemed to be a national trend. Professor Staecker asked if the 3 – 2 year program between Fairfield University and UCONN, RPI, and Columbia would be discouraged with this new proposed program that offered a masters. Professor Lyons felt this new program would just offer another option for students. Professor Bilias Lolis asked how faculty would be able to determine the undergraduate's potential for graduate education since students would be deciding on graduate education at such a young age. Professor Lyons feels this is not a problem since student and professor ratio is low so professors have a good assessment of candidates' potential. Professor Scalese proposed that the School of Engineering change the requirement in Art History to show that students are required to take a course in VPA History and not solely Art History. Professors Beal and Lyons agreed to fix this on curricula plans.Professor Bayers made the motion to terminate the AD Program in Engineering and Professor Bilias Lolis seconded. The motion passed unanimously.

Dean Babington made the motion to approve the Dual Program in Engineering and Professor Staecker seconded. Professor Bilias Lolis felt the need for this program is well identified and that the program seems to be modeled well but asked if there were other benchmarks that would predict success the Engineering faculty could use to admit the young undergraduates to a graduate program. The idea of entrance examinations for graduate programs not showing indications for success was made. Professor Staecker reinforced that the Engineering faculty do request two recommendations for admission from faculty at the time students apply for this new program. The motion passed unanimously.

Prof. Scalese made a motion to adjourn. Professor Harriet seconded and the motion was unanimously approved.The meeting adjourned at 4:35 p.m.

Respectfully submitted,

Sheila Grossman