ABET Accreditation
Self-Study Report

School of Engineering
Fairfield University

Degree Program:
Bachelor of Science in Computer Engineering

August 8, 2005

Table of Contents

Self-Study Report

Of the

Bachelor of Science in Computer Engineering program

A. Background Information

1. Degree Titles

Bachelor of Science in Computer Engineering (BSCR).

2. Program Modes

The Computer Engineering program is a day and evening program with full-time and part-time students.

3. Actions to Correct Previous Shortcomings

The program has not been evaluated for accreditation before. There have been several actions undertaken over the last 6 years to bring the program to a higher level of learning and to better match the program objectives.

We have introduced 11 new courses with a focus on: digital design, signal processing, scientific visualization, mathematics and physics. We have integrated object-oriented design throughout the curriculum, in order to strengthen our program in the area of computer science.

4. Contact Information

Professor Douglas Lyon, Ph.D.
Computer Engineering program Chair
School of Engineering
Fairfield University
1073 N Benson Rd
Fairfield, CT 06824
(203) 254-4000 ext 3155
DLyon@mail.fairfield.edu

B. Accreditation Summary

Criterion 1 Students

This chapter gives a profile of the students enrolled in the department. It describes the student services in the university and the School of Engineering. It discusses student evaluations, advising, monitoring, and the processes and procedures used for the acceptance of transfer students and for the evaluation of credit for courses taken elsewhere. It provides evidence that student monitoring procedures are working by explaining the vehicles used to gather data, analyze data, and to correct student performance, where needed. This section describes feedback processes that ensure course objectives are met.

1.1 Profile of Engineering Students

Students in the Computer Engineering program generally fall into three categories, full-time, part-time and transfer:

1. Presently, over 80% of our students are full-time. They engage in a four-year plan of study and ranked in the top 20% of their high-school class. Their SAT scores range from 1180-1310.
2. Part-time students typically work for local industries and pursue their studies by taking one, two, or three courses per semester. These students bring a wealth of practical experience and a strong work ethic into the classroom.
3. Most transfer students come from local community colleges. Typically, they will have completed the equivalent of two full-time years (four semesters) and have an associate's degree in an engineering area.

Admission of Full-time students

The University Admissions Office admits entering full-time students. The admissions process uses a review of test scores, class rank, and grades. Admissions counselors take into consideration each individual applicant's strengths and prospects for success. The majority of incoming students rank in the top 15-20% of their class. Typically, they originate from the New England states and the Mid-Atlantic States.

Admission of Part-time students

Part-time students apply directly to the School of Engineering for admission. Many of the part-time students have taken coursework at other institutions. A staff of engineering counselors first screens their applications and supporting transcripts. Admission recommendations are forwarded to the Dean of Engineering for approval. The part-time students tend to bring to the student body a mature perspective and a wealth of industrial experiences. This sets the stage for a higher level of performance among all students.

General Transfer Policy

The BSCR program allows up to 64 credits to be transferred from accredited programs if they are equivalent to ours. The last 60 hours must be completed in residence.

The equivalency of a course transferred into the School of Engineering is determined by examination of the course description, the syllabus, and the textbook. If there are any issues, further information is sought from the professor and the school of origin of the transferred courses.

We have articulation agreements with several community colleges. These agreements help pre-establish course equivalency and ease the transition to Fairfield University.

No matter the source, Computer Engineering students meet the same criteria for graduation. This includes a plan of study that contains mathematics, basic science, liberal arts, and engineering, totaling to a minimum of 132 credit hours.

The success of a student's academic career is a function of the quality of the learning environment. Freshmen are introduced to engineering concepts and the nature of engineering disciplines in Fundamentals of Engineering.

Close attention is paid to student performance by the engineering faculty, and this contributes to our high retention rate. The means for creating the conditions for student achievement of program learning goals is the School's Assessment and Continuous Quality Improvement Process (ACQIP) that accompanies this self-study report. The School of Engineering has used ACQIP since 1997.

In their senior year, students participate in the Senior Design Project, a design experience that reflects the degree to which the prescribed program goals have been achieved.

The components of the plan for assisting and monitoring student progress in the School of Engineering are described in Section 1.2.

1.2 School of Engineering Student Services

1.2.1 Advising/Counseling

A regular, daily, advising/counseling service is scheduled in the Engineering Advising Center, Room 213 McAuliffe Hall. Three counselors provide advising: Joe Laganza, Joe McFadden, and Kim Siladi. But in the Computer Engineering program, the department chair is primarily responsible for advising students in the Computer Engineering Program. This responsibility is occasionally share by chairs in other departments, including Jerry Sergent (Electrical Engineering), Rao Dukkipati (Mechanical Engineering), Don Joy (Software Engineering) and other faculty. The Dean and associate Associate Dean participates, when needed, as secondary advisor. Advising hours are from 6:30 to 9:30 p.m. Monday to Thursday, and Friday by appointment, and during office hours by program chairs.

The essential aspect of this service is that it is regular (running now for the ninth year). It is conducted on the basis of a daily schedule in a permanent location, the Advisory Center, set aside for this purpose so that students are confident that they can find assistance in planning their studies when they need it.

1.2.2 Tutoring

The learning process is enhanced, by means of the tutorial services offered on a daily basis in the School of Engineering. Tutoring is useful to both traditional students and to students who re-enter college after a long absence. As with the advising/counseling services, tutoring is provided free of charge by degreed tutors in areas of mathematics, physics, chemistry, computer programming and, in engineering, on a daily basis, 6:00-9:00 pm, Monday through Thursday, and Friday by appointment, in the McAuliffe Hall tutorial center.

Students are assured that they will always find a tutor when they go to the Engineering tutorial center. A schedule of additional services is published and distributed to all students at the beginning of each academic term. Statistics regarding this activity are provided in the Assessment Report compiled at the end of each term. Examples from the spring and fall 2004 terms accompany this self-study.

1.2.3 Pre-Registration and Additional Advising

Students are required to meet with their academic advisors to plan their course of studies. Frequent communications from the Dean’s office encourage the students to review their academic schedule with their academic advisor in order to keep abreast of their progress in their undergraduate career.

The Computer Engineering Program Chair meets with the incoming full-time BSCR freshmen at an orientation session. This typically takes place in June, prior to start of classes in September. The students receive their schedules and are given a tour of the engineering facilities. They are made aware of the regularly scheduled, free tutoring sessions provided by the School of Engineering. Beginning with the fall of their first semester, the Chair meets with each student on an individual basis, at least once per term, to discuss their schedule for the oncoming terms and their progress during the current term. Most full-time students follow the schedule as described in the catalog and primarily need advice on their electives.

The part-time students are advised each term as well. Most part-time students take no more than two courses in the evenings and must be counseled to take these courses in the proper sequence so that they will have the prerequisites for future courses.

1.3 Monitoring of Student Progress and Intervention

The faculty submits a progress report for each student in each course where a student is at-risk (C- or lower). The reports are submitted at four-week intervals during the academic term.

Professors notify the Dean’s office in writing, identifying students making unsatisfactory progress. The associate Dean then informs the program chair. The chair meets with the students who are at-risk and takes the appropriate action needed to bring them back up to a satisfactory level.

The action taken may include extra tutoring, counseling, or simply a lecture on the need to develop and maintain good study habits. The process is a closed-loop system. This includes the student’s self-assessment of their at-risk condition. The guidance offered to improve academic performance is documented to insure that the recommended action takes place. The results of the actions are monitored to insure that they are effective by tracking the student's progress. The Student At-Risk Form, annotated by the advisor/tutor, is returned to the Engineering Office and placed in the student’s file. A comparison between the 4th week list and the 8th week list of Students At-Risk assessments provides a glimpse into the effectiveness of the process.

1.4 Assessment and Continuous Quality Improvement

1.4.1 General Comments on Assessment

Assessment is used to evaluate the student's ability to meet academic requirements and impacts directly on the curriculum and pedagogy employed to assist in achieving program-learning goals.

Student learning is the core of the academic activity in the School of Engineering. Data is collected throughout the academic term in order to monitor student learning. The data on outcomes is assessed using the ACQIP.

Students, faculty and administration are involved in the ACQIP. This results in changes in educational strategies, course content and resource enhancement.

The results of the data analysis are compiled, each term, in a school-level Term Assessment Report that serves as a guide for corrective actions. The assessment reports for each term are kept for three years, and are available and accessible to all faculty, advisors and administrators.

The program leaning goals and outcomes assessment are revisited in more detail under Criterion 3.

1.4.2 Faculty Input into the Assessment Process

The faculty provides a number of inputs into the assessment and quality control process. These are described in Section 1.4.2.1. The forms make use of a details course-level competency assessment, as described in Section 1.4.2.2.

1.4.2.1 Faculty -The Student-at-Risk Surveys

All faculty are requested to provide a list of students in their classes who are at academic risk (C- or lower), on the fourth and the eighth week of the term.

The form survey triggers action steps toward enhancing the students academic performance through active advising and tutorial assistance. Comparison of the fourth week list with the eighth week list provides evidence as to the effectiveness of the steps taken to resolve prior academic issues.

1.4.2.2 Course-level Competency Assessment

At the conclusion of each term, the instructor completes several forms. The forms collect data on each student in the class. The demonstrate class competency levels, in the aggregate. This survey is accomplished through forms C, D, and F shown in Tables 1-A, 1-B and 1-C, below:

Table 1-A Form C – Basic Knowledge Competencies

1. Analytical skills: Translates mathematics and science concepts into practical applications using appropriate technical methods, processes, and tools. 2. Communication Skills: Articulates ideas in a clear and concise fashion, and uses facts to reinforce points. Written materials flow logically and are grammatically correct. Plans and delivers oral presentations effectively. Uses technology and graphics to support ideas and decision 3. Creative problem solving: Applies logic in solving problems and analyzes problems from different points of view. Develops many potential solutions to problems without rushing to premature conclusions. Uses modern engineering tools. 4. Life-Long Learning: Learns independently and continuously seeks to acquire new knowledge. Exceeds basic requirements of an assignment and brings in relevant outside experience to provide advanced solutions to the problems at hand.	5. Project management: Sets goals, prioritizes tasks and meets project milestones. Seeks clarification of task requirements and takes corrective action based upon feedback from others. Creates action plans and timetables to complete assigned work. Completes homework assignments on schedule. 6. Research skills: Uses computer based and other resources effectively thus acquiring information from multiple sources. Organizes, interprets and validates data appropriately. 7. Systems Thinking: Understands how events interrelate and demonstrates an ability to take new information and integrate it with past knowledge. Integrates and uses knowledge from various courses, including Engineering, Physics, Mathematics, and Social Sciences, to solve technical problems. 8. Teamwork: Each student contributes a fair share to the completion of the task or project. Everyone participates, listens and cooperates with other students. Members share information and help reconcile differences of opinions when they occur.

Form C is the general School of Engineering basic knowledge competency form. It reflects the basic knowledge goals of the Computer Engineering program. As stated above, the instructor fills out this form online as grades are submitted at the end of the semester. The responses to the form are then compiled so that deficiencies for any student can be determined and corrected by meetings with the Dean and through tutoring and advising.

Table 1-B Form D – Project Management and Project Competencies

1. Need-based design and demonstration of need: Discusses the need for the proposed design in an objective and realistic manner. Presents research that demonstrates need for the proposed design. Applies design methodology. 2. Aspects of proposed design that satisfy need: Identifies and evaluates what, if anything, currently satisfies the need addressed by the proposed design. 3. Reasoning in selecting among alternative designs: Uses rational, objective reasoning (common sense) to select from among alternative ways to satisfy the design need.	4. Constraints/limitations in implementing design: Identifies constraints/limitations that may be encountered on the project. 5. Objectivity in predicting performance: Anticipates the performance of the design in an objective manner and does not make unsubstantiated claims. 6. Evaluation of effectiveness of final design: Determines ways of evaluating effectiveness of the final design.

Form D is the general Project Management form used by courses that have a project component. The language of the form is generic, fitting all departments. In computer engineering the form fits the requirements gathering and design aspects of a project.

Table 1-C Form E – Lab Competencies

1. Planning: Establishes a plan for the proposed laboratory in a logical and structured manner. 2. Preparation of experimental set-up: Prepares an adequate procedure and set-up of the laboratory experiment. 3. Data acquisition: Uses rational, objective reasoning (common sense) to select from among alternative ways to satisfy the design need. 4. Data analysis: Acquires appropriate data to support the purpose of the laboratory. 5. Ability to choose among alternative set-ups: Uses rational, objective reasoning (common sense) to select from among alternative ways to satisfy experimental needs.	6. Constraints/limitations in experimental procedure: Identifies constraints/limitations that may be encountered during the experiment. 7. Objectivity in predicting results: Anticipates the results of the experiment in an objective manner but does not make unsubstantiated assumptions. 8. Ability to draw substantive conclusions: Prepares a substantiated conclusion for the laboratory experiment.

Instructors in laboratory courses use Form E to indicate the instructor's view of the student's ability.

Faculty assessment of students is recorded on forms C, D and E, using a scale that ranges from 1-5. The data is graphically represented by the use of a histogram, as illustrated in Figure 1-A, which shows student ranking for the General Knowledge competency of Analytical Skills on a scale from one to five.

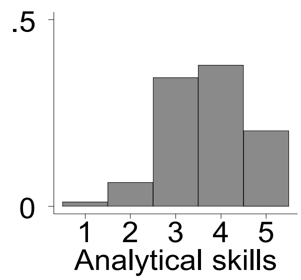

Figure 1-A An example of a histogram showing the distribution of student scores on a scale of 1 to 5 for the first of the Basic Knowledge Competencies.

There are comprehensive charts that show the mean and range for all competencies. These appear in Appendix III. If the mean or minimum values are below 3, a conference between the faculty and the program chair, or the Dean is held. The meeting is used to identify the students who might need special attention. The raw and summarized data are included in the school-level Term Assessment Report.

The student competencies in Forms C, D, and E, are connected to the Computer Engineering program learning goals, as discussed in Criterion 3. They summarized in the following table:

Table 1-D School of Engineering General Program Learning Goals

A. KNOWLEDGE IN THE DISCIPLINE
A.a Math and Science: Knowledge of relevant and fundamental areas of mathematics and science, and applications. A.b Fundamentals: An up-to-date understanding of the fundamental areas in the discipline, and associated technologies A.c Specialization: In-depth understanding of at least one area of specialization.
B. SKILLS
B.a Problem Solving: An ability to identify, formulate and solve open- ended engineering problems. B.b Engineering Design: An ability to design a system, a component or a process to meet desired needs. B.c Hypothesis Testing: An ability to design and conduct experiments as well as collect, analyze and interpret data. B.d Communication: Highly developed verbal and written communication and evaluation skills. B.e State-of-Art Tools: An ability to use the techniques and modern engineering tools necessary for engineering practice.
C. LIFE-LONG PRACTICES
C.a Lifelong Learning: A desire and respect for innovation, life-long learning, and currency of one's knowledge and skills. C.b Liberal Arts: Appreciation and knowledge of the liberal arts and contemporary issues in a global environment. C.c Collaborations: How to function as collaborators and leaders in team-driven environments.
D. A SENSE OF SOCIAL RESPONSIBILITY
D.a Technology and Society: An appreciation of the role of engineering technologies and solutions in society D.b Professional Ethics: An understanding of professional and Ethical responsibility D.c Justice and Service: Respect for justice and willingness to serve societal needs.

Criterion 3 describes the Program Outcomes and Assessment as well as the relationship between these goals and the EAC Criterion 3 (a-k).

Each of the competencies in forms C, D, and E reflect the achievement of learning goals in the School of Engineering. This connection is summarized in Table 5, below. The notation A.a to D.c along the left side of the matrix, as given above, identifies the learning goals. The competencies from forms C, D, and E are given along the top of the matrix. At least five competencies reflect the achievement of each one of the program general learning goals.

Table 1-E Matrix relating Course-level Competencies to Program Learning Goals

Course Competencies

Program Learning Goals

	C1	C2	C3	C4	C5	C6	C7	C8	D1	D2	D3	D4	D5	D6	E1	E2	E3	E4	E5	E6	E7	E8
A.a	X						X				X				X							
A.b	X						X				X				X							
A.c	X										X											
B.a	X		X			X									X						X	
B.b									X	X	X	X	X	X								
B.c											X				X	X	X	X	X	X	X	X
B.d		X						X								X		X		X		X
B.e			X								X	X	X	X			X	X				
C.a				X	X	X	X			X												
C.b							X															
C.c								X														
D.a							X		X	X			X	X								
D.b									X				X	X								
D.c									X													

Thus, for example, Competency 1 in Form C, "Translates mathematics and science concepts into practical applications using appropriate technical techniques, processes, and tools," is connected to program learning goals A.a, A.b, A.c, and B.a.

In conclusion, the course-level faculty input provides one of several ways that the achievement of program learning goals is measured in the School of Engineering.

1.4.2.3 <u>Program Wrap-up Session</u>

At the end of each term, the final meeting of program faculty is devoted to a discussion of the highlights of the term. Both pedagogical successes and student problems encountered by each faculty member in the program, in the course of the term are discussed. This information is eventually documented on a Wrap-up Session form, submitted to the Dean's office and filed into the program portfolio.

Program chairs and the Dean review the forms and use the information to plan appropriate action in support of better faculty engagement, quality management and improvement. The template for the Term Wrap-up Form, along with a companion survey form on the Quality of the Instructional Environment, is included in the ACQIP document that accompanies the self-study report. The results of these surveys are includes in the school-level Term Assessment Report, compiled each term.

1.4.3 Student Input into the Assessment Process

Students provide input into the assessment and quality control program in two ways.

First, they have direct input assessment form (as described in Section 1.4.3.1) for each engineering course they take at mid-term and at the end of the term.

Secondly there is a student representative on the SOE Assessment Committee and recent graduates complete an exit survey (as described in Section 1.4.3.2).

1.4.3.1 Student In-Course Assessments

These are described below. Three separate course-level surveys among students in course provide input to the assessment process in the School of Engineering.

a. *Third-Week Student Course Assessment* – The survey form is displayed below in Table 1-F. Two-way feedback, instructor-student and student-instructor, typifies pedagogy in the School Engineering. This survey is in accord with this intent to create a healthier learning environment in every class offered in the School. Students are requested to complete this survey form and return it to the instructor for his/her review and assessment of the students' perspective of the course.

Table 1-F School of Engineering- Third Week Course Assessment

Course Date:					
ASSESSMENT ELEMENTS	1 DISAGREE	2 AGREE SOMEWHAT	3 AGREE	4 AGREE STRONGLY	5 VERY STRONGLY AGREE
1. The course is meeting my expectations					
2. Lectures/lab assignments are well organized					
3. The homework assignments help reinforce learning					
4. The course textbook is adequate (if applicable)					
5. The course handouts are adequate (if applicable)					
6. Extra help is available					
Comments or Recommendations					

b. *End-of-Term Student Instructional Assessment* – This survey focuses on teacher effectiveness. It consists of ten assessment elements. This is addressed in Criterion 3 and the ACQIP document. The results of the survey are compiled for every class, and the data are reduced to a summary page. This information is included in the Term Assessment Report for each term, and is filed in the School-level portfolio. Program chairs and the Dean review the final results, and conferences with faculty are arranged, when necessary, to gain insights that might lead to quality improvement.

c. *End-of-Term Student Assessment of Learning* – This survey focuses on the students' perception of having achieved the course learning goals as described in the course syllabus. It is discussed further under Criterion 3 and in the ACQIP document that includes a sample survey form. The survey forms are suitably scored and the data are reduced to map out problem areas. The program chair and the Dean review the results.

They can trigger conferences with faculty and students, when necessary to improve the quality of the learning environment. These are included in the Term Assessment Report.

1.4.3.2 Feedback from Recent Graduates

Graduating seniors are surveyed annually, immediately following their graduation. The survey questionnaire, included in ACQIP and discussed further under Criterion 3, offers the respondents an opportunity to assess their experiences as engineering students at Fairfield University, and evaluate the impact of their studies on their career. The results of the survey are compiled and reviewed by the Dean for input into the Plan-for-Change of the School of Engineering.

The reader should consult the ACQIP document, p. 19, for a more comprehensive view of the way these surveys enter into the plan for continuous improvement in the School of Engineering. A summary of the advising and assessment process is also presented in Figure 3-A, under Criterion 3.

1.5 Transfer policies and Assessment Procedures

The Department of Computer Engineering uses the transfer policies of the University and the School of Engineering. The assessment procedures also are from the University and the School of Engineering. They are discussed in the following sections.

1.5.1 Pre-College Transfer Credits

Fairfield University accepts a variety of both pre-college and transfer credits. The following describes those university-level policies:

Advanced Placement:

Fairfield University will award credit toward graduation for each AP course taken by a student, provided he/she has taken an Advanced Placement Test administered by the College Entrance Examination Board program and obtained a test score of four or five. It is the discretion of college/school officials to determine if such AP credits can be used to exempt students from specific University courses or requirements. Normally, AP credit will not exempt a student from requirements in his/her major.

Higher Level International Baccalaureate Courses

Fairfield University recognizes the advanced nature of Higher Level International Baccalaureate courses. Generally, three credits may be awarded toward a Fairfield degree for a Higher Level IB course taken by a student provided a grade of six or seven is achieved.

College Courses Completed While in High School

High school students who earn college credit while still enrolled in high school can transfer those credits to Fairfield University if the following conditions are met: (1) A grade of C or better, (2) the official college transcript is sent to Fairfield, and (3) the student's high school counselor sends written verification that the college credits or coursework were not used to fulfill high school graduation requirements, either in subject area or credits. No more than a total of 15 such credits will be accepted by Fairfield.

1.5.2 Transfer Credit

When students begin their university studies at other institutions and subsequently transfer to Fairfield University, the University accepts transfer credit under the following conditions: (1) no courses with grades less than C will qualify for transfer, (2) credit will be granted only for specific work completed at regionally accredited institutions whose quality has been approved by the University, and (3) only credit hours, not grades, will transfer.

Residence Requirement: Every transfer student is required to complete at least two years of full-time (or equivalent part-time) undergraduate study at Fairfield in order to receive a Fairfield University Bachelor's degree.

Community Colleges

Several of the Connecticut community colleges with engineering/technology programs have signed articulation agreements for credit transfer when their graduates (Engineering Associate's degree) are admitted to Fairfield University for degree completion. Prime examples are the Naugatuck Valley Community College, the Norwalk Community College, Gateway Community College, and Three Rivers Community College.

1.5.3 Policies for Transfer of Credit by Matriculating Students

Courses taken at another institution are initially assessed against courses in the Fairfield University curricula by an advisor/counselor. The completed assessment forms along with official transcripts are sent to the Dean for final approval of credit transfer. Credits, not grades, are transferable, and only if the student has earned a grade of C or better for that course.

Students are cautioned that deans will grant permission to take courses elsewhere only when they can demonstrate compelling reasons to do so. Typically, students attend other institutions while on approved Educational Leave of Absence during the fall and/or spring semester to participate in a study abroad program, or to take advantage of a special curriculum offered at another US institution, or to enroll in courses during the summer or winter vacation.

Records

Official transcripts from other schools and the Transfer Credit Form, signed by the SOE Dean, are kept in the student's file secured in the Dean's office. Courses taken elsewhere and used to satisfy either University core or Engineering program requirements are annotated on the Audit Sheet and then entered into the electronic student database system. Each semester, hard copies of each student's Courses Completed/Transferred form are signed by the respective Department Chair and then placed in the student's file. This process insures that the policies for the acceptance of courses taken elsewhere are enforced.

1.5.4 Degree Progress and Audits

The SOE office maintains a database of student records tied to the specific program requirements pertinent to that student (degree name and catalog year). The database is updated each semester and hard copies are printed out for the Dean, Associate Dean and Program Chairs. This database helps advisors assist both full-time and part-time students schedule their courses in an optimal correct sequence.

In addition, the University Registrar and Academic Computing Services developed an automated system in which each student as well as their advisor and the Dean or Associate Dean may run an on-line degree check. This system is particularly useful for determining whether or not specific University core requirements have been met. For example, the US Diversity and World Diversity requirements can be met by taking particular general education courses and, in some instances, specific sections of courses. This information, then, is used as aid in helping students plan their course schedules.

Any student wishing to graduate at the end of the current semester must submit a Graduation Application. Filing the Graduation Application triggers the Graduation Audit signed by the Dean or Associate Dean after verification that all University core and Engineering program graduation requirements have been satisfactorily met.

1.6 Conclusion

A profile of the students entering the School of Engineering's Computer Engineering program was introduced in Section 1.1 of this report.

Section 1.2 presented the student services available in the School of Engineering, including student counseling, intervention, advising, tutoring and monitoring. The next section described assessment at the course-level. Program-level assessment will be described in Criterion 3.

Course-level assessment is used to ensure that learning goals are met. Assessment activities are documented in the Assessment and Continuous Quality Improvement Process (ACQIP) document that accompanies this self-study report; some of the forms are reproduced in this document. The means for creating the conditions for student achievement of program learning goals is the School's ACQIP plan.

Student learning is the essential element of the academic activity in the School of Engineering. This is measured using assessment instruments produced by the faculty and the students. Faculty input comes from:

1. The Students-at-Risk Surveys
2. Course-level Competency Assessment (forms C, D, and E)
3. Program Wrap-up Session
4. The instructional environment survey

Student Input comes from course-level assessment:

5. Third-Week Student Course Assessments
6. End-of-Term Student Instructional Assessments
7. End-of-Term Student Learning Assessments

Policies for screening transfer credits are detailed under the categories of pre-college credits and transfer credits.

Criterion 2 Program Educational Objectives

2.1 Introduction

Program educational objectives are supported by program learning goals, in accord with the mission of Fairfield University and the mission of the School of Engineering. Hence, the mission and learning goals that drive the education and shape the identity of Fairfield engineering graduates, and presage their professional accomplishments, are reviewed in the following paragraphs.

2.1.1 Fairfield University Mission

Fairfield University is a coeducational institution of higher learning whose primary objectives are to develop the creative intellectual potential of its students and to foster in them ethical and religious values and a sense of justice and social responsibility. A Fairfield education is a liberal education, characterized by its breadth and depth. It offers opportunities for individual and common reflection, and it provides training in such essential human skills as analysis, synthesis and communication.

Fairfield recognizes that learning is a lifelong process and sees the education that it provides as a foundation upon which its students may continue to build within their chosen areas of scholarly study or professional development. As a community of scholars, Fairfield joins in the broader task of expanding human knowledge and deepening human understanding, and to this end encourages and supports the scholarly research and artistic production of its faculty and students.

Fairfield has a further obligation to the wider community of which it is part, to share with its neighbors its resources and its special expertise for the betterment of the community as a whole.

Fairfield University values each of its students as an individual with unique abilities and potentials and it respects the personal and academic freedom of all its members.

2.1.2 The School of Engineering Mission

In the framework of Fairfield University's mission, the School of Engineering strives 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 as an absolute requirement. In pursuit of this mission, the School of Engineering will commit its resources to the nurturing of the intellectual capital and skills of its 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 effectively 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

The School maintains a continuous engagement with the community. By serving the manpower and professional needs of industry and business it strengthens its commitment to excellence in engineering education. The School provides options for lifelong education and renewal of skills to Connecticut engineers.

The School is committed to serve all its constituencies, within and outside the University, with integrity, clarity of purpose, and unequivocal professionalism. To achieve this goal, the School has adopted the following tenets of effective student learning and pedagogy:

- Close relationships between the School and its students are a very high priority. Teaching faculty are guided to understand patterns of student learning, and to employ methods that best support student learning and personal growth. They use proven principles and/or create and experiment with new ones, in support of effective student learning.
- Engineering faculty need be expressly knowledgeable in their respective fields so that they may guide programmatic, curricular, and pedagogical change; they will strive for awareness of the new frontiers in their discipline through regular review of professional journals, attendance of conferences, and interactions with visiting academic and industrial practitioners.
- Faculty will learn to identify opportunities for exciting new programs, and will initiate or influence strategic change.
- They will integrate laboratory experiences into class presentations and involve their students in "learning through doing".

2.2 Educational Objectives

Guided by the above mission, the Computer Engineering faculty has formulated a set of Program Educational Objectives that describe the expected accomplishments of graduates in the first several years after graduation. The objectives are published in the University undergraduate catalog and span four areas:

1. Domain Knowledge,
2. Professional Practice,
3. Lifelong Learning, and
4. Engineering Citizenship.

In the following paragraphs, describe the core elements of the BSCR program educational objectives.

2.2.1 Domain Knowledge

"Graduates will be able to apply their in-depth understanding in areas of computer systems within constraints of performance specification, budget and scheduling."

Graduates of the Computer Engineering BS program work at the intersection of computer science, software engineering and electrical engineering. They apply their technical skills to the design of computer-based systems (both hardware and software). The Computer Engineering program has domains of knowledge in the areas of mathematical applications of computer science, object-oriented design, scientific visualization, signal processing.

The Computer Engineering program at Fairfield University has a strong foundation in the fundamentals of engineering, including courses in mathematics and science, mechanical engineering, computer programming, liberal arts, as well as major courses in computer engineering. In addition, electrical engineering courses and laboratory experiences are crucial elements of the program. Students take elective courses in their area of interest. Students have enough courses in mathematics and physics to obtain minors in both programs. Students in the Computer Engineering program are encouraged to apply for a minor in these areas.

The design aspect of engineering is emphasized throughout the curriculum. In their very first engineering course, Fundamentals of Engineering, students test and implement engineering design, and, in their very last course, the Senior Design Project, an interdisciplinary course, they design, construct, and test more elaborate systems in response to identified need.

The program strives to insure that its graduates will never be placed in a totally unfamiliar situation in professional practice. They are trained to be contributors to evolving technology at their place of work, to identify opportunities for breakthroughs and assume the initiative in decision-making circumstances.

The Fairfield University Mission includes the Jesuit goal of service. Educating students so that they can practice in their profession is a bare minimum requirement for them to be able to perform service to the community. Thus, the education of computer engineers is consistent with the Fairfield University Mission.

2.2.2 Professional Practice

"Graduates will develop their engineering design, problem-solving skills and aptitude for innovation as they work on multi-disciplinary teams."

Graduates of the Computer Engineering program will practice their profession either as individual contributors or as members of a team in a competent and efficient manner. They are known for their knowledge in computer engineering and in-depth understanding of computer systems.

From their very first course, "Fundamentals of Engineering", to their last course, "Senior Design Project", our students are taught the value of working as members of a team. They develop a statement of work, a schedule, a budget, and a project plan. They submit weekly progress reports and make formal presentations at the end of the first and second term. At the end of the second term they present prototypes of deliverables.

In addition to engineering acumen, the Senior Project course trains students to work alone on their particular part of the project, as well as to work on a team to make all the individual parts work as a system. Senior projects address problems that prepare students to work in the computer engineering profession.

In addition, summer internships, often continued into the academic year, afford opportunities to students to work and be mentored by industry engineers and to sample the environment and mindset of engineering at the workplace.

2.2.3 Lifelong Learning

"Graduates will become experts in their chosen fields and broaden their professional knowledge with formal and/or informal continuing education."

Graduates of the Computer Engineering program will be members of their professional society and will be committed to continue as lifelong learners and contributors to their discipline, and remain alert to its relation to society.

School of Engineering students are members of the Engineering Student Society (ESS), a blanket organization that encompasses all branches of engineering. Guest speakers are often invited to address students. They generally encourage students to join the professional society branches after graduation. Membership in a professional society provides lifelong learning through local and national meetings and journals.

In addition to contributing to their professional organizations, students' attitudes are shaped by the liberal arts curriculum at Fairfield University, including fourteen courses in such areas as English (three) History (two), Philosophy (two), Engineering Ethics (one), Religious Studies (two), Social Sciences (two), and Fine Arts (two). Two general electives complete the cycle of liberal education for the engineering majors. The ethics course is intended to establish principles of responsible professional behavior. Among the liberal arts courses, students are required to choose two of which are designated to satisfy criteria for World Diversity and US Diversity. The content of the diversity courses broadens the horizons of student education across boundaries of ethnicity, culture, and economic conditions.

Finally, engineering majors have the option of one semester of study abroad, in such countries as Ireland, Germany, South Africa, Australia, UK, and elsewhere. This experience stimulates also a sense of the value of continuous learning across a spectrum of history, economics, social and cultural institutions.

Having well-rounded members of society is consistent with the mission of Fairfield University. This is achieved by endowing our graduates with an education that has both breadth and depth.

2.2.4 Engineering citizenship

"Graduates will practice the ethics of their profession consistent with a sense of social responsibility."

Graduates of the Computer Engineering program will practice in an ethical and professional manner and will constantly be aware of the impact of their efforts on safety and the environment. They will be active in and of service to the community. Graduates have a sense of social responsibility, making decisions that reflect their skill in the application of professional ethics.

The Jesuit mission of Fairfield University includes a directive of service to the community. Only by being able to relate engineering technologies to others in society can service be effective.

In keeping with the mission of Fairfield University, engineering students are constantly aware of the need to serve their community. It is reiterated that one required course in the curriculum is dedicated to ethics. Fully 30% of undergraduate students participate in off-campus service activities coordinated by the Campus Ministry. The ideas of service and ethical practices are re-enforced in meetings of the Engineering Student Society during the school term. Engineering citizenship requires that engineering graduates be engaged in public service, putting their expertise in technology to achieve the most good.

Ethical professionals are important to the Jesuit goals of justice and service. Consistent with the mission of Fairfield University, and the needs of our constituencies, the ability to practice and apply professional ethics is of utmost importance.

While the theory of ethics is an important goal of some programs, our emphasis is on the application of ethical guidelines. As a result, several cases are considered for a wide variety of situations that may arise in the computer engineering profession.

2.3 Review of Program Educational Objectives

The BSCR program educational objectives are periodically reviewed by the SOE constituencies and by stakeholders of the program. These groups include:

1. Students in the program and recent graduates
2. Alumni Association
3. Other Schools in the University, e.g., Arts and Sciences, School of Business and the School of Education.
4. Engineering faculty
5. Employers
6. Computer Engineering Advisory Committees

The following subsections address each of the constituencies, in turn.

2.3.1 Students in the program and Recent Graduates

Our assessment process is documented in the ACQIP handbook. The process is both formative and summative.

Graduates of the program respond to a survey immediately upon their graduation. They are invited to provide feedback on the Computer Engineering program and on their preparation to perform effectively in their professional occupations. Their responses in this survey enter the database used in the Outcomes Assessment process as described in the ACQIP document that accompanies the present self-study report.

The engineering undergraduate student body has both full time and part-time students. Those latter are traditionally employed in industry and work closely with graduate engineers. They have a direct view of the knowledge and skills required on the job in their company. This knowledge is often transferred to engineering faculty who might translate the workplace needs to curricular requirements.

The full-time students have the Engineering Student Society as a pathway to promote and transfer their ideas to the School's faculty and administration. In addition, students in course fill out comprehensive evaluation forms reflecting how well their courses meet their expectations. This information is reviewed and is included in the Term Assessment Report.

2.3.2 Alumni Association

Our feedback from Alumni is conducted at the School of Engineering level. It provides both formative and summative feedback. This is done via a regularly scheduled assessment instrument. We maintain contact with our alumni using the SOE database; The Advisory Board of the School includes SOE alumni.

Input from these constituencies enters the architecture of the engineering curricula with an eye to the students' preparation for achieving the program educational objectives.

There are approximately 1800 names and addresses of School of Engineering alumni from graduate and undergraduate programs in the School of Engineering database and the Fairfield University Alumni Association database.

2.3.3 Other Schools in the University

For major curricular issues, the School of Engineering is in continuous collaboration with the four programs in the School of Arts and Sciences, namely, physics, mathematics, computer science and chemistry. All four programs have created courses specifically for engineering and physics majors, so that they can directly address the topics of primary interest to the engineering programs. Chairs of these three four programs collaborate with the Dean of the School of Engineering and the engineering program chairs in setting the goals of courses that serve engineering majors.

2.3.4 Engineering Faculty

The engineering faculty is directly involved with the evolution of program curricula, the pedagogy employed for their implementation, the resources required to prepare the students to achieve the educational objectives. The faculty has open lines of communication with the program chairs and with the Dean of the School of Engineering. Curricular issues are continually under the microscope, and decision-making on those issues is driven by the program educational objectives. Course learning goals and instructional methods achieving them are described in Forms A and F, as contained in the course portfolio and illustrated in Figure 3-A under Criterion 3. Course syllabi are reviewed every term, in accord with the requirements described in the ACQIP document. In departmental meetings, in the end-of-term departmental wrap up sessions (see ACQIP), and in direct communications with colleagues and the Deans, program faculty have the opportunity to provide input that shapes the program's effectiveness in preparing students to achieve the educational objectives. Along these lines, faculty development takes in half-day general faculty meetings twice a year.

2.3.5 Employers

Our ties to industry are quite close, and we often visit industry on-site, both to promote our own programs and to obtain formative feedback about our curricula and educational objectives.

For example, Northrop Grumman, a local radar manufacturer, makes extensive use of signal processing in their avionic systems. They emphasize network programming and scientific visualization as well.

Sikorsky is another industrially-based constituent. They make helicopters. Their avionics systems use network programming, signal processing, image processing, and visualization. Some of our adjunct instructors have worked (or continue to work) at Sikorsky and some of our graduates are recruited to work at this organization.

There are 450 dot-com companies in Fairfield County. We find that our use of Java is very important to an industry that has embraced object-oriented design in reliable server-side applications. As a result, we have integrated Java into our program.

Our Computer Engineering program embraces sound object-oriented design principles in the curricula. Thus, grounding in this area gives our graduates a head start when entering into industry.

Our domains are formulated to help our partnerships with industry. For example, Northrop Grumman demands a program that includes a strong domain in signal processing. As a part of this strategic partnership, we have also offered an on-site MS degree in ECE. This has proved very popular with both students and industry and has served to give us even more feedback about our curricula and educational objectives, improving our knowledge of the needs of industry.

2.3.6 Advisory Committees

The School of Engineering Advisory Board consists of 17 members, several of them leading their engineering organizations. The School of Engineering Advisory Board operates under a Governance Document that identifies the Board's objectives and the tasks of its various subcommittees. The Board meets four times a year, in September, December, March and June, while its subcommittees carry out their tasks as required. The Board reviews and approves engineering programs and provides input in support of the vision that guides the School of Engineering.

Faculty members are represented at the Computer Engineering Industrial Advisory Group, School of Engineering Dean's Council, the School of Engineering Advisory Board and faculty at the Computer Engineering wrap-up sessions. These groups meet at regular intervals and have published minutes. They serve to provide formative feedback regarding curricula and educational objectives.

The Computer Engineering Program has an Advisory Group that meets every term and discusses program educational objectives and other matters of curricular content. The group brings into the discussion information and suggestions regarding professional trends in computer engineering.

2.4 The Computer Engineering Curriculum and Evaluation

The constituencies described in Section 2.3 enable us to gather feedback about the Computer Engineering program and its curriculum. These elements enable us to undertake assessment and improvement of both our learning goals and our program educational objectives.

The present status of the Computer Engineering curriculum is described in the University undergraduate catalog. The program faculty, led by the program chair, evaluates the curriculum to ascertain its effectiveness in supporting the program educational objectives. Quite often, the curriculum is benchmarked against that of other well-respected institutions.

The catalog describes the sequence of courses through a four-year course of study, and includes the description of course content and course pre-requisites. The University uses the Banner system to enforce the course pre-requisites at registration time. Engineering faculty is also alert to the need to confirm that students in their courses have satisfied the established pre-requisites.

The learning goals of each course are described in "Form A", which defines how the course will meet the program learning goals and the educational objectives. A companion Form F details the distribution of instructional time among the course learning goals. The place of forms A and F in the assessment scheme is illustrated in Figure 3-A, under Criterion 3. Using Form A as a reference, a detailed syllabus is prepared for each course that includes how the course material relates to the objectives. The syllabus is discussed with the students at the first class meeting, and provides a basis for their review of the course at the end of the term. Forms A and F, and the syllabus, are saved in the course portfolio. They are updated on a regular basis.

With the help of their advisors, students enroll for the courses in the proper sequence. The Fairfield University Banner system is able to prevent students from enrolling in a course without the stated prerequisites.

At least one elective course is offered each term. The content of these courses is based on student interest, relevance, and input from the Computer Engineering Program Advisory Group.

Table 2-A below shows how each course in the BSCR curriculum supports the BSCR program educational objectives.

Course	Program Educational Objectives: 1. Domain Knowledge	2. Professional Practice	3. Life-Long Learning	4. ENgineering Citizenship
AH 10 Intro To Art HIstory I			x	x
CD 211 Engr. Graphics Cad I	x	x		
CR 245 Digital Design I	x	x		
CR 245L Digital Design I Laboratory	x	x		
CR 246 Digital Design II	x	x		
CR 310 Voice And Signal Processing	x	x		
CR 311 Image Processing	x	x		
CR 320 Computer Networks	x	x		
CR 325 Computer Graphics	x	x		
CR 382 Indpendent Study	x	x	x	
CR 390 Senior Project I	x	x	x	x
CR 391 Senior Project II	x	x	x	x
CS 131 Comp. Programming I	x	x		
CS 132 Comp. Programming II	x	x		
CS 232 Data Structures	x	x		
EC 11 Microeconomics		x		x
EE 213 Analog Electronics & Circuits I	x	x		x
EE 213L Analog Electronics & Circuits I Lab	x	x		
EE 345 Microprocessor Hardware	x	x		
EE 345L Microprocessor Hardware Lab	x	x		
EG 31 Fund. Of Eng.	x	x	x	x
EG 32 Fund. Of Eng.	x	x	x	x
EN 11 Composition & Prose		x	x	x
EN 12 Intro To Literature		x	x	x
English Elective		x	x	x
General Elective				
HI 30 Europe & World In Trans.			x	x
History Elective			x	x
MA 125 Calculus I		x	x	
MA 126 Calculus II		x	x	
CS 231 Disc Math		x	x	
MA 351 Prob And Stat.		x	x	
MA 227 Calculus III		x	x	
MA 228 Calculus IV		x	x	
MA 321 Ord Diff Equat		x	x	
Major Elective 1		x	x	
ME 201 Statics	x		x	
ME 203 Kinimatics and Dynamics	x		x	
PH 10 Intro To PHilosophy			x	x
PH Elective			x	x
PH/RS Elective (Ethics)			x	x
PS 15 Gen.PHysics I		x	x	
PS 15L Gen.PHys.Lab		x	x	
PS 16 Gen.PHysics II		x	x	
PS 16L Gen PHys Lab		x	x	
PS122 Optics/PS122l Optics Lab		x	x	
PS122L Optics Lab		x	x	
CR 206 Electro-Optical Communications Lab	x	x		
RS 10 Intro Religious Study			x	x
RS Elective			x	x
Social Science Elective 1&2			x	x
AH 10 Intro To Art HIstory I			x	x
CD 211 Engr. Graphics Cad I	X	X	x	

Table 2-A Table showing how courses in the BSCR curriculum support the BSCR program objectives.

2.5 Ongoing Evaluation of Goals and Objectives

Continuous quality improvement is practiced in the Computer Engineering Program, and throughout the School of Engineering, according to The Assessment and Continuous Quality Improvement Process (ACQIP). The assessment process is multifaceted and is described in detail in the ACQIP document accompanying this self-study report.

The following groups participate directly in this process:

Dean's Council--includes Dean, Associate Dean, Laboratory Director, Fundamentals of Engineering Coordinator and department chairs of the undergraduate and graduate degree programs. It oversees the ACQIP process.

Quality Management Committee -- includes faculty, a student representative and is chaired by the associate Dean. It determines the kind of data that must be collected, the manner and method for data collection and management, and the preparation of reports with assessment results.

Laboratory Planning/Laboratory Usage Committee - composed of faculty and laboratory staff, chaired by Director of Laboratories. It has the responsibility of integrating laboratory experiences into the curriculum, recommend the necessary resources for this purpose, and conduct long-term planning for engineering laboratories across the curriculum in collaboration with program chairs.

Through these working groups, the faculty has achieved broad participation in the Assessment and Continuous Quality Improvement Process in the School of Engineering.

ACQIP provides a continuous stream of data and feedback on the degree of achievement of learning goals in support of the program educational objectives. The data compiled in the course of each academic term is entered into a database, and reduced to project out the information that is necessary to implement continuous quality improvement. Almost all the accumulated data, including student work, are also entered into course portfolios and program portfolios that serve as a library of materials reflecting the evolution of programs, methods and educational practices in the School of Engineering. Finally, a complete Term Assessment Report is compiled at the end of the term. It constitutes the basis for continuous quality improvement. Term Assessment Reports are archived and are available for review upon request. Two examples, from the spring and fall 2004 semesters, accompany this self-study volume.

2.6 Conclusion

In this criterion we reviewed the educational objectives of the Computer Engineering program. We also reviewed the manner in which that are monitored and supported. In the introduction, we described the context of the program, within the school of engineering, and within the broader context of Fairfield University.

Section 2.4 described how the input from constituencies enables us to continuously assess and improve our program. Feedback from constituencies is essential for the assessment and achievement of our educational objectives. It is reiterated that a summary of the planning and assessment process is shown in Figure 3-A under Criterion 3. The entire quality management cycle via planning and assessment is contained in the ACQIP document accompanying this report.

Criterion 3 Program Outcomes and Assessment

Preliminaries

In the previous section, under Criterion 2, an analysis was presented of program educational objectives, the constituencies that provide feedback to the program, and the process for managing and employing the information gathered from the constituencies. In this section we turn to the key issue of Criterion 3, the program learning goals and their compatibility with EAC Criterion 3 (a-k) goals, and to the data that assist in the assessment of the outcomes that measure the achievement of those goals.

3.1 Documentation of the Assessment Process

The reader is invited to review first the document titled Assessment and Continuous Quality Improvement Process (ACQIP) that accompanies this Self-Study Report. ACQIP describes the nuts and bolts of the assessment process that has been in effect in the School of Engineering since 1997. The protocols for data gathering, data reduction, outcome measurement, and plan for change to promote the further development of the program, are all delineated in detail in ACQIP. The assessment process is embedded in a three-year cycle, The Quality Management Cycle, and in the Program and Course-Level Planning and Assessment, on p.4 and p.20 respectively of ACQIP. For the sake of convenience, the Quality Management Cycle is reproduced in Appendix III of the present document. The Program and Course Level Planning and Assessment scheme which describes the sources of data and, importantly, the timeline for planning and assessment, will be shown later in this section. ACQIP has been expanded and improved continuously since its first inception in 1997. It reflects the commitment of the School of Engineering to desirable standards of engineering education and to the educational and pedagogical philosophy that govern its academic activities.

3.2 Assessment Process Outcomes

The results from the assessment process are compiled every term in a Term Assessment Report. These reports identify areas that might require special attention from faculty, program chairs, advisors and the Dean. They also include statistics on SOE student services, and constitute the basis for corrective actions that would improve the program structure and the learning environment, and/or assist students in course who require special attention. Examples of the Term Assessment Report from spring 2004 and fall 2004, also accompany this Self-Study report. References will be made in the following narrative to both ACQIP and the Term Assessment Reports.

Assessment reports are used to assess Computer Engineering students at the departmental level. The Computer Engineering faculty reviews the assessment of student competencies during the end of the term wrap-up sessions.

3.2.1 Course Portfolio

All data relevant to every course in the Computer Engineering program are kept in individual course portfolios. The data are updated during and at the end of each term. Each portfolio includes:

- Forms A and F and the course syllabus, explicitly describing the learning goals and expected outcomes of the course (see Appendix IV in ACQIP).
- Samples of homework submitted and tests taken by students in the course, as well as the final comprehensive examination. All these are course content examinations.
- The instructor's response to the 4th and 8th week surveys on Students at Risk, and the follow-up actions regarding those students. Students at risk are those whose work reveals possible impediments in achieving the course outcomes on the 4th and 8th week of the term. Actions to assist those students in overcoming difficulties are undertaken.
- The results of data on student competencies as assessed by the instructor (see discussion on Forms B, C, D, and E later in this section). Reported unsatisfactory competencies trigger actions on the part of program chairs.

Additionally, student assessments of the course become part of the Assessment Report.

3.2.2 Program Portfolio

This portfolio includes mainly the instructors' responses to the Dean's survey regarding the quality of the instructional environment and Instructor' reports, from the program Wrap-up Session held at the end of each term. These are used to assess student performance and the instructional milieu. For example, if problems arise with a student, in several courses, this will be brought out in the session. The advisor is made aware of the students' difficulties and help is provided.

3.3 Computer Engineering Curriculum and Learning Goals

The Computer Engineering curriculum consists of courses in the sciences, math, liberal arts, as well as in software engineering. There is a large liberal arts core taken by our students that reflects the mission of the University to instill students with a liberal education that has a focus on ethical values and a sense of justice and social responsibility.

3.3.1 Curriculum

As shown in the Quality Management Cycle (Appendix III this document, and p.4 in ACQIP) the first step in this process is the determination of program learning goals and educational objectives. From these the program content, i.e. the program curriculum, is derived. The driving force for the curriculum is the program's learning goals. The BSCR 4-year curriculum is detailed in the Engineering Undergraduate catalog, and in a different form on the next page.

The graduation requirement with the BSCR degree is 132 credits. There are 48 credit hours devoted to the liberal arts, 21 credit hours devoted to mathematics and 16 credit hours devoted to physics (including EE213/EE213L, which are often taught by the physics department). As a result, Computer Engineering students are eligible for a minor in mathematics and physics.

BS DEGREE IN COMPUTER ENGINEERING
School of Engineering
Fairfield University

Evaluation Record **2004/05**

Student ____________________ (Last, First, M.) Advisor/Chair ____________________ Required Credits = 132 credits

S.S. # ____________________ Date ____________________ Required residency = 60 credits

Total Transfer Credits ________

MATHEMATICS		ENGR FUNDAMENTALS		COMPUTER ENGINEERING		LIBERAL ARTS CORE	
MA 125 CALCULUS I	3	EG 31 FUND of ENGINEERING I	3	CR 206L OPTICAL COMM LAB	1	EN 11 COMPOSITION & PROSE	3
MA 126 CALCULUS II	3	EG 32 FUND of ENGINEERING II	3	CR 246 DIGITAL ELECTRONICS DES II	3	EN 12 INTRO TO LITERATURE	3
MA 227 CALCULUS III	3			CR 310 VOICE & SIGNAL PROC	3	ENEL ENGLISH ELECTIVE	3
MA 228 CALCULUS IV	3			CR 311 IMAGE PROCESSING	3	HI 30 EUROPE & WORLD IN TRANS	3
MA 231 DISCRETE MATH	3	**ELECTRICAL ENGINEERING**		CR 320 COMPUTER NETWORKS	3	HIEL HISTORY ELECTIVE	3
MA 321 ORD DIFF EQUATIONS	3	EE 213 INTRO to ELECT CIRCUITS I	3	CR 325 COMPUTER GRAPHICS	3	**PHILOSOPHY, RELIGIOUS STUDIES**	
MA 217 APPLIED STATISTICS	3	EE 213L ELECTR CIRC 1 LAB	1			PH 10 INTRO to PHILOSOPHY	3
		CR 245 DIGITAL ELECTRONICS DES I #	3			RS 10 INTRO RELIGIOUS STUDY	3
PHYSICS		CR 245L DIGITAL ELEC DES I LAB #	1	**CR MAJOR ELECTIVE**		PREL PH/RS ELECTIVE (ETHICS)	3
PS 15 GEN PHYSICS I	3			**REQ'D (3 CREDITS)**		PHEL PHILOSOPHY ELECTIVE	3
PS 15L GEN PHYSICS I LAB	1			CREL COMPUTER ENGR ELECTIVE	3	RSEL RELIGIOUS ELECTIVE	3
PS 16 GEN PHYSICS II	3	**GRAPHICS**				*Other	
PS 16L GEN PHYSICS II LAB	1	CD 211 ENGINEERING GRAPHICS	3			**SOCIAL SCIENCES**	
PS 122 MOD OPTICS & WAVE PHEN	3			**SENIOR PROJECT**		EC 11 MICROECONOMICS	3
PS 122L OPT & LASERS LAB	1			CR 390 SENIOR PROJECT I	3	SSEL SOCIAL SCIENCE ELECTIVE	3
				CR 391 SENIOR PROJECT II	3		
		COMPUTER SCIENCE				**FINE ARTS**	
		CS 131 COMPUTER PROGRAMMING I	3			AH 10 ORG & TRANS in WEST ART	3
		CS 132 COMPUTER PROGRAMMING II	3	**MECHANICAL ENGINEERING**		CD 211 Approved for 3 cr	
		CS 232 DATA STRUCTURES	3	ME 201 ENGINEERING STATICS	3	**GENERAL ELECTIVE**	
						GE1 GENERAL ELECTIVE 1	3
						GE2 GENERAL ELECTIVE 2	3

TRANSCRIPT DATA:

ADVISORÕS COMMENTS

9/8/08 **# SAME AS EE245 AND EE245L** **Exempt = 0 credits**, students can take another Elective course

Figure 3-A BSCR program curriculum sheet showing categories of courses required. The student's advisor uses the sheet to track progress through the curriculum.

3.3.2 Learning Goals in Comparison with the EAC a-k Outcomes.

The courses in the curriculum are established to support the program learning goals shown in Table 1-D under Criterion 1, and ultimately the program educational objectives given in Criterion 2. The learning goals of the Computer Engineering program are also described on pp 6-7 of ACQIP. For the sake of convenience, they are reproduced here in Table 3-A, left column, along with their correspondence to the EAC Criterion 3 outcomes on the right column (as in Table I in ACQIP).

Table 3-A Correspondence between BSCR program Goals and ABET Criterion 3 outcomes

BSCR Program Learning Goals	EAC Goals (Criterion 3 a-k)
A: KNOWLEDGE IN THE DISCIPLINE A.a Math and Science: Knowledge of relevant and fundamental areas of mathematics and science, and applications. A.b Fundamentals: An up-to-date understanding of the fundamental areas in the discipline, and associated technologies A.c Specialization: In-depth understanding of at least one area of specialization.	(a) An ability to apply knowledge of mathematics, science, and engineering
B: SKILLS B.a Problem Solving: An ability to identify, formulate and solve open- ended engineering problems. B.b Engineering Design: an ability to design a system, a component or a process to meet desired needs. B.c Hypothesis Testing: An ability to design and conduct experiments as well as collect, analyze and interpret data. B.d Communication: Highly developed verbal and written communication and evaluation skills. B.e State-of-Art Tools: An ability to use the techniques and modern engineering tools necessary for engineering practice.	(e) An ability to identify, formulate, and solve engineering problems. (c) An ability to design a system, component, or process to meet desired needs. (b) An ability to design and conduct experiments, as well as to analyze and interpret data. (g) An ability to communicate effectively (k) An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.
C: LIFE-LONG PRACTICES C.a Lifelong Learning: A desire and respect for innovation, life-long learning, and currency of one's knowledge and skills. C.b Liberal Arts: Appreciation and knowledge of the liberal arts and contemporary issues in a global environment. C.c Collaborations: How to function as collaborators and leaders in team-driven environments.	(i) A recognition of the need for, and an ability to engage in life-long learning (h) The broad education necessary to understand the impact of engineering solutions in a global and societal context (j) A knowledge of contemporary issues (d) Ability to function on multi- disciplinary teams
D: A SENSE OF SOCIAL RESPONSIBILITY D.a Technology and Society: An appreciation of the role of engineering technologies and solutions in society D.b Professional Ethics: An understanding of professional and ethical responsibility D.c Justice and Service: Respect for justice and willingness to serve societal needs.	(h) The broad education necessary to understand the impact of engineering solutions in a global and societal context (f) An understanding of professional and ethical responsibility.

Hence, all twelve EAC Criterion 3 (a-k) goals are addressed by the BSCR learning goals.

It is now important to note how the BSCR program learning goals, A.a to D.c, in Table 3-A are in support of the four educational objectives of the BSCR program as described in ACQIP, p.8, and in the previous section under Criterion 2. Table 3-B below illustrates the extent to which this is accomplished. It should be noted that at least five program learning goals underlie each educational objective, so that the likelihood is maximized that BSCR graduates will be able to meet those objectives within a few years of graduation.

Table 3-B Matrix Relating Learning Goals to BSCR Program Educational Objectives

	Program Educational Objectives			
BSCR Learning Goals	1. Domain Knowledge	2. Professional Practice	3. Life-Long Learning	4. Engineering Citizenship
A.a Math & Science	X	X		
A.b Fundamentals	X	X		
A.c Specialization	X	X		
B.a Problem Solving	X	X		
B.b Engineering Design	X	X		
B.c Hypothesis Testing	X	X		
B.d Communication		X		
B.e State-of-art Tools	X	X	X	
C.a Lifelong Learning	X	X	X	
C.b Liberal Arts		X	X	X
C.c Collaboration		X	X	X
D.a Technology and Society		X	X	X
D.b Professional Ethics		X		X
D.c Justice & Service		X		X

A narrative description of the learning goals is now in order to clarify further how these goals support the program objectives:

Knowledge in the discipline

A.a. - MATH/SCIENCE. Knowledge of the relevant and fundamental areas of mathematics and science, and applications.

• Students will learn and apply the following mathematics to their computer engineering discipline:

a) Linear algebra

b) Differential equations

c) Object-oriented applications

• Students will acquire fundamental knowledge and learn to apply the following:

a) Computer science

b) Digital design

c) Signal processing

A.b. - CR/TECHNICAL. An up-to-date understanding of the fundamental areas in the discipline, and associated areas.

• Students will understand and apply the following fundamental concepts in computer engineering:

- Signal processing
- Computer visualization
- Computer systems / networking / architecture

A.c.-SPECIALIZATION. Students will demonstrate an in-depth understanding in at least one area of specialization. Examples of these areas include, but shall not be limited to:

- computer science
- software engineering
- mathematics
- electrical engineering
- computer hardware

<u>Skills in the practice of computer engineering</u>

B.a. - PROBLEM SOLVING. An ability to identify, formulate, and solve open-ended engineering problems.

B.b. - DESIGN. An ability to design a system, a component, or process to meet desired needs.

B.c. - EXPERIMENTS. An ability to design and conduct experiments as well as collect, analyze, and interpret data.

- Students acquire rudimentary skills in laboratory experimentation as part of the physics requirement.
- Students perform experiments in the areas of signal processing, visualization and computer systems.

B.d. - COMMUNICATIONS. Students demonstrate verbal and written communication and evaluation skills as a part of their English and Senior Project requirement.

- Students are skilled in the areas of literature and written communication through a strong liberal arts core curriculum.
- Students give oral presentations and do extensive reading both in and out of their field.
- Students make oral presentations and prepare written reports as part of a professional level senior project.

B.e. - ENGR TOOLS. An ability to use the techniques and modern engineering tools necessary for engineering practice.

- The domains of scientific visualization and signal processing require a demonstrated ability of state-of-the-art software and hardware subsystems.
- Students can prepare written programs that require demonstrated knowledge in object-oriented design and analysis.

<u>Students acquire life-long professional practices.</u>

C.a. - TECH PRACTICES. A desire for innovation, life-long learning, and currency of one's knowledge and skills.

- Students learn to use resources, such as library and online search engines.

C.b. - HUMANISTIC. Appreciation and knowledge of liberal arts and contemporary issues in a global environment.

- Students have an extensive liberal arts core in the university curriculum that gives them a well-rounded foundation in areas outside the engineering field.

C.c. - TEAMWORK. Students can function as collaborators and leaders in team situation.

- Students develop team communication and leadership skills during their senior project.

<u>A sense of social responsibility.</u>

D.a - SOCIETY. An appreciation of the role of engineering technologies and solutions in society.

- Students have exposure to industry through internships they are carefully chosen to foster both an appreciation for engineering and its role in society.

D.b. ETHICS. An understanding of professional and ethical responsibility.

- Students have informal and formal training in engineering ethics in the curriculum and through the internships.

D.c. Justice and Service

- Justice and Service is integrated into the undergraduate curriculum. This includes the 16-course core. Students take 3 courses in English, 2 History, 2 philosophy, 2 religious studies, 1 ethics, 2 social sciences, 2 fine arts, and 2 general electives. Some of those courses support the justice and service part of the university mission.

3.4 Plan for Continuous Improvement

The assessment plan for the BSCR program goals at Fairfield University – described in detail in the ACQIP document - is based on an ongoing process that starts at the level of individual courses and continues to the program level. The SOE Quality Management Committee (QMC) is coordinated by the Associate Dean and reports to the Dean. Faculty, students, advisors and the Dean's Council are all involved in the process. Aside from monitoring students' progress through the 4th week and 8th week Students at Risk survey, outcomes are assessed at the end of each term by means of data from Forms B, C, D, and E, as described below. The sources of data and the established timeline of assessment and quality improvement are embedded into the Program and Course Level Planning and Assessment construct shown in Fig 3-B on the next page. Along with Appendix I, this information is at the core of assessment in the School of Engineering. A more elaborate version of Fig.3-B is on pp.25-27 of the ACQIP