Capstone Courses and Program Outcomes - TC2K Assessment

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Abstract

This paper discusses course objectives, student learning outcomes, teaching strategies, assessment techniques, and continuous improvement used in conducting a two-semester capstone course. It leads the students from the conceptual stage in senior project design to the actual implementation stage. The course is intended to enable students to succeed as an entry-level technologist and/or engineer in industry and also to establish an important feedback mechanism for overall program evaluation. This paper presents the experience of one program and some of the lessons learned for satisfying ABET TC2K requirements.

I. Introduction

Recent accreditation reform efforts accomplished by the Accreditation Board of Engineering and Technology (ABET) address new philosophy including enabling program differentiation, outcome-based preparation, comprehensible and achievable criteria and educational objectives. Objectives of ABET accreditation include [1]

- To identify to the public, prospective students, student counselors, parents, educational institutions, professional societies, potential employers, governmental agencies, and state licensing or certification boards, specific programs that meet minimum criteria for accreditation.
- To provide guidance for the improvement of the existing and development of future educational programs in engineering, technology, computing, and applied science areas.
- To stimulate the improvement of engineering, technology, computing and applied science education in the United States.

The ABET-TAC outcome-based accreditation assures quality education of engineering technology students with a total quality management approach that focuses on inputs from constituencies, teaching-learning process and outcomes, student achievement, graduation, employment, faculty qualification and development, supporting facilities and resources, and continuous improvement. Engineering technology programs may be accredited at the associate or baccalaureate degree level. Accreditation decisions are based solely on the appropriate ABET-TAC (Technology Accreditation Commission) criteria, policies and procedures as defined in the ABET documents "Accreditation Policy

and Procedure Manual" [1] and "Criteria for Accrediting Engineering Technology Programs" [2] for evaluation during the 2004-2005 accreditation cycle. ABET definitions of terminology, accreditation processes and procedures are described in [1]. Accreditation of a program is granted for a specific period, usually two or six years. Accreditation for a full term of six years indicates that a program satisfied the published criteria of the Commission granting accreditation. The outcome-based criteria (TC2K) for evaluations during the 2003-2004 accreditation cycle which consists of 7 separate criterion was completely updated in November 1, 2003. The new TC2K consists of 8 separate criterion: (1) Program Educational Objectives, (2) Program Outcomes, (3) Assessment and Evaluation, (4) Program Characteristics, (5) Faculty, (6) Facilities, (7) Institutional and External Support, and (8) Program Criteria.

Many papers addressed various teaching and learning issues using a traditional approach that is not directly related to the program outcomes assessment. Examples of these studies include the paper [3] preaching more out-side funded project for improving the quality of the capstone senior design projects; the paper [4] studied the impact of group size of the student and quality of course outcome; and the paper [5] showed that multi-disciplinary team projects provide students with an opportunity to expand not only their knowledge, but also their approach to design. Engineering technology faculty members and administrators around the U.S. are preparing the needed assessment information to prove that their students at the end of the program satisfy the required "a" through "k" program outcomes of Criterion 2. The paper [6] reports the finding of using a departmental graduation exam for assessing program outcomes, course improvement and enhancement activities. The paper [7] studied how to design expected outcomes for senior design courses to support TC2K assessment. The papers [8], [9], and [10] present some insights and strategies for satisfying TC2K requirement.

This paper reports our findings in reassessing senior-design courses for supporting ABET TC2K program accreditation review evaluation. The discussion topics are the TC2K criteria, the EET program educational objectives, program outcomes, the outcomes of two-semester capstone courses (senior design projects), the relationship of the courses to program outcomes, course assessment methods and evaluations, and how to use results in continuous quality improvement and to provide supporting information for an ABET TC2K visit.

II. Program Objectives, Outcomes, Assessment, and Continuous Improvement

The ABET 2000 criteria are based on the principles of total quality management (TQM) and continuous improvement. ABET TC2K requires that each program stating its mission that is consistent with the institutional mission. The mission must be translated into specific program educational objectives and program outcomes that are expected as a result of the educational process. The program outcomes should be measurable and must be assesses regularly. The results of outcomes assessment should be used as feedbacks to make program improvements. Finally, a quality assurance and management process must be in place to achieve success.

Program Educational Objectives: We adopted a model framework based on Baldrige education criteria for performance excellent [11] shown in Figure 1 by combining ABET TC2K outcome-based accreditation and university outcome assessments to assuring quality education in electrical engineering technology. ABET-TC2K Criterion 1. Program Educational Objectives states "Although institutions may use different terminology, for purposes of Criterion 1, program educational objectives are broad statements that describe the career and professional accomplishments that the program is preparing graduates to achieve during the first few years following graduation. …."

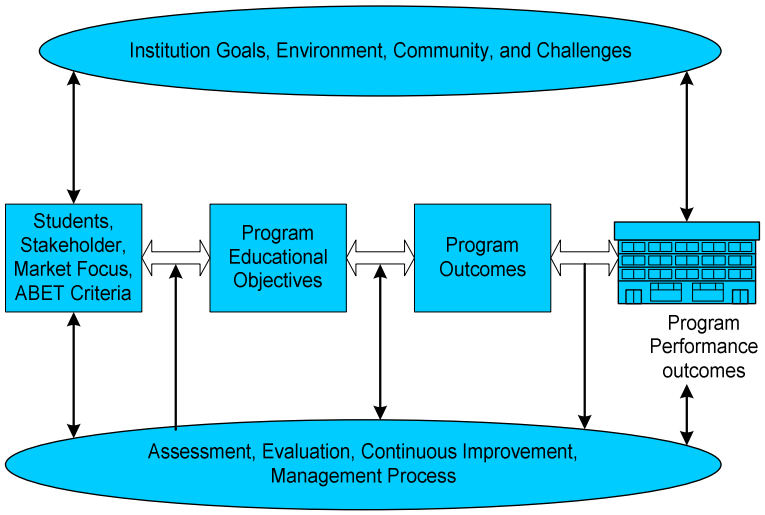

Figure 1. A Framework for Accomplishing Educational Performance Excellence

A set of program educational objectives, as shown below, is built around connecting and reinforcing department leadership, institution mission and goal alignment, inputs from constituencies, and ABET TC2K criteria. The assessment and continuous quality improvement should be integrated at various levels of teaching-learning process as a feedback control mechanism for ensuring all necessary activities for achieving objectives in the long-term, efficiently and economically even when strategy and goals change over time. We note that measures and assessments serve both as a communications tool and a basis for deploying consistent overall performance requirements.

Our EET Program Educational Objectives are:

1) Have the knowledge and ability to use current industrial practices and design procedures for development and implementation of electrical/electronic(s) systems.
2) Be prepared for career advancement, promotion, and mobility.
3) Have the knowledge and ability to continue learning, either on-the-job or in graduate school.
4) Be contributing members of society and the profession.

Program Outcomes: ABET-TC2K Criterion 2 Program Outcomes states "Although institutions may use different terminology, for purposes of Criterion 2, program outcomes are statements that describe what units of knowledge or skill students are expected to acquire from the program to prepare them to achieve the program educational objectives. These are typically demonstrated by the student and measured by the program at the time of graduation. …"

TC2K Criterion 2: Program Outcomes

a. an appropriate mastery of the knowledge, techniques, skills and modern tools of their disciplines,
b. an ability to apply current knowledge and adapt to emerging applications of mathematics, science, engineering and technology,
c. an ability to conduct, analyze and interpret experiments and apply experimental results to improve processes,
d. an ability to apply creativity in the design of systems, components or processes appropriate to program objectives,
e. an ability to function effectively on teams,
f. an ability to identify, analyze and solve technical problems,
g. an ability to communicate effectively,
h. a recognition of the need for, and an ability to engage in lifelong learning,
i. an ability to understand professional, ethical and social responsibilities,
j. a respect for diversity and a knowledge of contemporary professional, societal and global issues, and
k. a commitment to quality, timeliness, and continuous improvement.

Our EET Program Outcomes are:

1) The students will posses the appropriate mastery of electronics and computer skills to function effectively in industry.
2) The students will have the knowledge and ability to adapt to emerging applications and processes in their field.
3) The students will demonstrate the ability and skills to understand and apply experimental results and solve technical problems.
4) The students will have knowledge and skills to interact with others and function effectively in teams.
5) The students will have the ability to communicate effectively in oral, written, visual and graphical modes.
6) The students are prepared to understand the necessity for lifelong learning and the need for quality, timeliness, and continuous improvement.
7) The students are knowledgeable of expected standards of ethical and professional conduct.

As shown in Appendix 1, we carefully mapped the required courses of A.S. and B.S. degrees to TC2K Criterion 2.

III. Outcome-Based Capstone Courses and Program Assessment

As the students progress through the EET curriculum, the two-semester senior design project course (ECET 490 and ECET 491) is an important course to help students to acquire technical design experience for appropriate careers through systematic exercising

of design projects in a carefully controlled academic environment. Students are encouraged to collaborate on design projects with industry, government agencies, university departments, or community institutions.

Course Outcomes: Criterion 2 "Program Outcomes" and Criterion 8 "Program Criteria" [2] are used carefully to design capstone course outcomes as shown below. We noted that items "a-d" address hard skills and items "e-k" emphasis soft skills. Most teaching-learning cycles of outcomes-based courses may involve the following four stages: course planning, conduct teaching-learning process, assessment of progress and capturing new knowledge, and continuous improvement. From Appendix 1, it is no surprise to see that the two capstone courses meet all "a-k" requirements. The ECET 490/491 capstone courses outcomes are listed below.

ECET 490/ECET491 Course Outcomes: A student who successfully fulfills the course requirements will have demonstrated the ability to

1. integrate the knowledge gained in earlier courses, and be creative in identify, analyze, and solve a real-world problem with a hardware and/or software solution (Criterion 2, items a, b, f, h, i, j),
2. observe and apply ethical principles, personal values, and responsibility management practices (Criterion 2, items i, j, k)
3. use mathematics and sciences knowledge and apply them in all phases of one's design project: analysis, design, prototyping, and testing (Criterion 2, item b),
4. use manuals, handbooks, library and technical references, Internet search engines and Web sites, and material/equipment specifications, and computer in one's design project, where applicable for preparatory research (Criterion 2, items a, b),
5. apply hardware and/or software design methodologies and procedures: project identification, initial research and source contacts, system analysis/requirements, requirement review, design, design review, periodic progress report, procurement of materials, and planning (Criterion 2, items a, b, c, d, e, f, g, h, i, j, k)
6. use oral and written communication skills in a real-world problem solving situation (Criterion 2, item g)
7. provide and present the good project proposal, periodic progress reports, project presentation, and project proposal report (Criterion 2, items e, g, k)

We note that a design project is often thought of as a constructive problem-solving process. In general, students learn about the design by experiencing several interdependent and overlapping stages, including

1) Project Identification and Inception
2) Project Planning
3) Interactive Design
4) Implementation
5) Integration and Beta Testing
6) Documentation and Report Writing
7) Project Presentation

Instruction methods for the course sequence starts with students' researching project ideas, writing a project proposal, defining and limiting project objectives, making initial research and source contacts, procuring materials, and making periodic progress reports,

reviews, and presentations. The implementation of the proposed project starts in the second semester and includes research and final design, construction and testing, standard-format written technical reports (design review reports, design progress reports, testing reports, and final report) and oral presentation to faculty and other interested parties.

Capstone Course Assessment Strategy: An effective assessment process required all assessment data to be collected from multiple sources using multiple effective methods over multiple points in time. Applicable information related to faculty teaching, student learning, and supporting resources listed below are worth considering for use in course assessment/evaluation:

- Course outcomes/course content (syllabi, handouts): appropriateness of course outcomes, coverage of basic course content, up-to-date (currency) of course content, course organization, concepts and knowledge of what must be taught, appropriateness of student work requirements, etc.
- Instruction methods and materials (course packs): suitability of methods of instruction to course outcomes, appropriateness of reading list for the course, reasonableness of time and efforts required to complete assignments, appropriateness of handouts and learning aids, suitability of media materials to course, and appropriateness of labs assigned in the course
- Students achievement (tests, assignments, reports): appropriateness of grading criteria, graded exams, graded homework assignments: instructor's comments, graded lab reports, graded projects reports, presentations, reports, journals, email exchanges, etc.
- Faculty member: course design, classroom performance, pedagogy, emphasize time on tasks and assignments, practice communicates high expectations, practice respects diverse talents and ways of learning, encourage cooperation among students, concern for and interest in teaching, homework assignments, text books, and handouts
- Assessment focus: individual students: performance (grades), teaching/learning supporting facility, faculty
- Responsible Parties: course instructor, assessment committee, department Chair
- Evaluation and Continuous Quality Improvement: evaluation comments (contribution to teaching within the department, in the discipline), suggested improvement (needed equipments, tools, faculty teaching, presentation skills, etc)

After thoroughly study, we selected the following assessment tools for evaluating the capstone courses:

- Unofficial student-faculty contact and feedback
- ECET 490 Senior Design Phase I Assessment Form with appropriate questionnaires (Appendix 1)
- ECET 491 Senior Design Phase II Assessment Form with appropriate questionnaires (Appendix 2)
- Project Presentation and Demonstration
- Written Report
- Instructor self course outcome evaluation

- Feedback from project sponsors if applicable

We realize the importance of the capstone courses in the program assessment process because they provide a combined direct measures of all items a through k of Criterion 2 and are able to provide an accurate measurement that can help overall program evaluation and continuing improvement. Figure 2 shows our assessment management process that enables us to implement an effective assessment strategy, which includes the following characteristics [9]:

- A strong focus on continuous improvement
- An embedded, ongoing assessment with timely feedback
- The assessment is based on curricula, reference the ABET TAC Program Criteria
- Clear guidelines are established regarding how to use assessment result
- All faculty members are involved

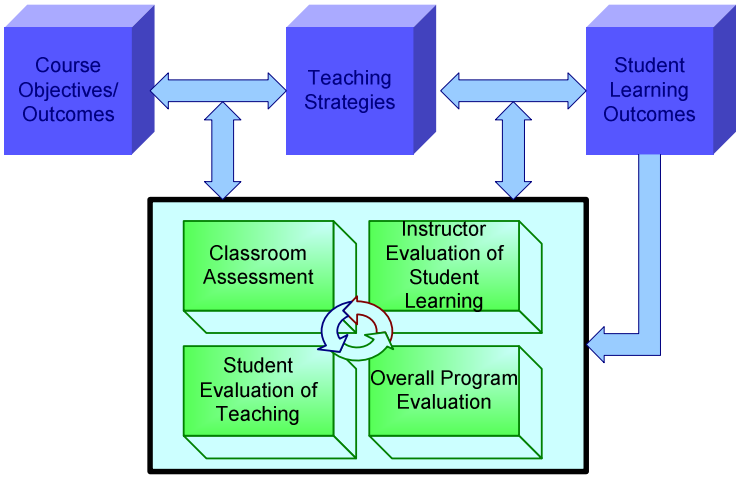

Figure 2. A Course Assessment Management Process with Program Assessment Support

IV. Capstone Courses Assessment Results

The assessment management process as shown in Figure 2 is executed with a course outcomes assessment prepared by the course instructor, then reviewed by a departmental assessment committee. Recommendations for continuous quality improvement (CQI) from both course instructor and the assessment committee are then forwarded to department chair for actions. Program chair and an assessment committee can work together using course assessments for program level assessment.

The capstone courses were assessed in the two consecutive academic years: 2001-2002 and 2002-2003. Student exit interview, annual graduate survey and employer survey are believed to provide additional measured information on graduate's technical knowledge, problem solving skills, use of equipment, work attitude, and work quality. These capstone course evaluation forms, as shown in Appendix 1 and 2, are designed, approved by ECET faculty, and updated semi-annually. The evaluation forms are used at the end of each semester for course assessment. The capstone course instructor arranges and invites

faculty to attend phase I and phase II presentations. Data entered in assessment forms by each faculty include percentage score of each specified category, comments, and grade. Student's final course grade is then averaged by the capstone course instructor.

Student Accomplishments (2001/2002 Academic Year): All graduates must successfully complete the BS capstone course. Projects generated in this course are evaluated by ECET faculty using the evaluation forms. The majority of students who enrolled in this course also take ENGW 421, Technical Writing, at the same time. Students and ECET faculty are encouraged to collaborate with local industries for work on senior design (creative & research) projects. The quality of the 2002 senior design projects were assessed using the following format and presented in [7]:

1. *Measures completed.*
Spring 2002 - EET 491 (9 students): 8 - A grade, 1 B - grade
Fall 2002 - EET 491 (7 students): 7 - A grade
2. *Findings.*
All the presented senior design projects were quite good. ECET Faculty and ENGW 421 professor were very impressed with student projects and presentations. Many projects dealt with emerging technologies. Majority of students who complete their senior design projects are able to receive their B.S. degree at the end of that semester. The expected course outcomes meet TC2K Criterion 1, items (a) through (k).
3. *Conclusions.*
This course continues to serve well as a capstone course not only for satisfying the BS EET degree requirement but also for use in student's job hunting as well. With the new requirements and objectives that we implement in the Spring 2002 and Fall 2002, it should help career training and better serve our students.

Because the ABET 2003/2004 Program Criteria did not provide an easy way for linking program educational objectives, program outcomes, and course outcomes, we encountered some difficulties while trying to use capstone courses assessment results to support program outcomes assessment. Nevertheless, we can see that outcomes of the students were consistent with expectations.

Student Accomplishments and Program Outcomes (2002/2003 Academic Year): During the 2002/2003 academic year, many methods and tools were used to collect assessment data for program preparing assessment and continuous improvement report. All major courses including ECET 111 Digital Circuits, ECET 107 Electrical Circuits, ECET 205 Microprocessor Fundamentals, ECET 296 C Programming Language Applications, ECET 296 Electronics Circuit Fabrication (a sophomore capstone course), ECET 357 Real-Time Digital Signal Processing, ECET 490/491 Senior Design Projects I & II were also assessed. For the capstone courses, we collect information on student-faculty contact and feedback (indirect measure), ECET 490 assessment form (direct measure), ECET 491 assessment form (direct measure), project presentation and demonstration (direct measure), written report (direct measure), instructor self-course outcome evaluation (indirect measure), feedback from project sponsors if applicable

(indirect measure), graduate exit interview, alumni survey, and employer survey. With the revised ABET TC2K Criteria that contains well spell-out program educational objectives and outcomes, we are able to apply the assessment data not only for the university assessment report but also for ABET visit preparation.

EET Program Outcomes Measurement and Criteria

The principle results of this assessment report is included in the 2002/2003 ECET Annual Assessment Report highlighted here, in which the continuous improvement actions are used to ensure quality improvement.

- Assessment measures for outcome 1: direct measure (capstone course ECET 490/491) and indirect measure (exit survey) - the ability to produce written documents, deliver oral presentations, develop, prepare and interpret visual information; and communicate these with a specific audience or client at a level of effectiveness expected of industrial employers.
- Assessment measures for outcome 2: direct measure (capstone course ECET 490/491), and indirect measure (exit survey) -the ability to effectively use information acquisition tools, implement technology and incorporate emerging technology into problem solutions.
- Assessment measures for outcomes 3: direct measure (capstone course ECET 490/491), and indirect measure (exit survey) - the aptitude to identify and analyze problems from all angles and concisely define its scope; response alternative solutions and techniques; assess viability of potential solutions; and exhibit ability and willingness to anticipate impact of proposed problem solutions.
- Assessment measures for outcomes 4: direct measure (capstone course ECET 490/491), and Indirect Measure (exit survey) - knowledge of scientific principles that are fundamental to the following applications areas: digital and analog electronics, electrical manufacturing controls, electronics communications, and/or computing systems.
- Assessment measures for outcomes 5: direct measure (capstone course ECET 490/491), and indirect measure (exit survey) - the ability and aptitude to solve open-ended problems and complete both individual and team electronics technology projects and communicate the results through oral and written reports.
- Assessment measures for outcomes 6: direct measure (capstone course ECET 490/491), and indirect measure (exit survey) - effective teamwork skills and initiative demonstrated through the design and construction of prototypes of electronic, telecommunications devices, or computer-based system by student teams.
- Assessment measures for outcomes 7: direct measure (capstone course ECET 490/491), and indirect measure (exit survey) -the ability to apply electronic design and troubleshooting techniques in the electronic circuits and/ computer-based system in a safe and proficient manner consistent with accepted industry standards.

Assessment Results

In addition to the project report, all students must make an oral report and demonstration of the completed project as part of the requirements of the course. About 30 minutes is scheduled for each oral presentation/demonstration. At project presentation time, the

forms as shown in Appendix 2 and 3, which consist of many quantitative and qualitative measures are use for evaluation. We also consider the two major factors "success in the course", and "quality of the oral report," relate directly to the completion of the BS capstone courses. The assessment results are:

- Quality of the written report: the majority of students who enrolled in this course also take ENGW 421 Technical Writing at the same time. The written report required for ECET491 is also used in ENGW 421 as the project report and is evaluated by the instructor of the technical writing course. The ECET 491 project reports and oral presentation/demonstration are evaluated by ECET faculty.
- Success in the course: (success of project demonstration. If no demonstration, the completion of an operational industrial project.); Fall 2002 - ECET 491 (8 students): 8-A's; Spring 2003 - ECET 491 (10 students): 4-A's, 5-B's, 1-D.
- All the Fall 2002 senior design projects were very good.
- For the Spring 2003 senior design projects, the ECET faculty were not pleased with the quality of student oral and written presentations; only 5 of the 9 projects were successfully demonstrated or resulted in completion of an operational industrial project.

We also ask ECET 490/491 students to fill the Graduation Survey (Indirect Measure) at the end of the project presentation. This survey also provides a very important feedback for overall program improvement.

- 2002-2003 Graduation Survey, Bachelor of Science (Electrical Engineering Technology): 10 survey forms were mailed to those who received the B.E. in spring 2003, only 3 were returned. The response rate is very low. To improve the response rate, the graduation survey will be conducted at the time of graduation. Some specific comments from students include: "Working students need improved access to ECET faculty in the evenings," "The focus should be more on applications rather than book knowledge and testing," and "Newer computers and more open labs on the weekends."

Assessment Summary

- The ECET Annual Assessment Report for the University was mainly prepared using the capstone assessment results.
- The ECET 490/491 Senior Design Projects I & II continue to serve ECET department not only for satisfying the BS degree requirement but also in helping students prepare for their careers.
- All 7 project presentations/completions conducted in fall 2002 were successful. This is primarily due to the work of the faculty member now supervising the course. The oral reports received generally high ratings from faculty.
- For spring 2003, only 5 of 9 projects were successfully completed. Non-work related projects have a higher failure rate and some oral reports received low/high ratings from faculty.
- Almost all written reports were received generally high ratings from faculty due to that almost every student would concurrently take ENGW 421 course.

Continuous Quality Improvement Actions

- In recent years, we found that our students lack of industrial experience, unlike those students in late 90's. To improve project successful rate, we are investigating the need of adding a project management course before two capstone courses. It was discussed in many curriculum meeting, and will seek inputs from Industrial Advisory Committee members in April 1, 2004's meeting.
- We also decided that the class meeting format change ECET 490/ECET 491 class format to have regular weekly meeting
- Improve senior design support
- Purchased 24 computers in Fall 2003 for networking laboratory, and 9 computers for circuit laboratory in Spring 2004

V. Summary and Conclusions

The continuous improvement is a never-ending process cycle that should be practiced at all levels and in all phases of the educational institution. During the last two years, we had learned the appropriate assessment processes, assessment tools, and skills. We also practiced those skills through preparation and implementation of Department Assessment and Continuous Improvement Plan (including mission, strategic objectives, program educational objectives, assessment of program educational objectives, program outcomes, assessment of program outcomes), the 2002/2003 outcome-based ECET Annual Assessment Report, outcome-based course assessment, and continuous improvement on all level of teaching-learning, laboratory equipment, facilities, and faculty development.

This paper presented an example of assessing outcome-based capstone courses which is not only satisfying the TC2k criteria and but also allowing the seamlessly integration of course-level and program-level assessment. The course is intended to enable EET students to succeed as an entry-level technologist and/or engineer in industry, and to establish an important feedback mechanism for overall program evaluation. A useful framework for accomplishing educational performance excellence and an assessment management process for course and program outcomes assessments is also presented. This paper also presented the experience of one program and some the lessons learned for satisfying ABET TC2K criteria requirements. It is our hope that this paper will provide a useful resource to professors in engineering technology engaged in ABET TC2K program review.

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Biographies

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Hal received his PE license in Indiana in 1988 and his PhD in Engineering (EE) in 1993. His research area is servo systems and he consulted for ITT Industries on weather satellite servos for 10 years. He is currently Associate Dean of the school of Engineering, Technology, and Computer Science, a senior member of IEEE and ISA and an IEEE program evaluator with fourteen TAC/ABET accreditation visits completed.

Appendix 1.

	1st Semester					2nd Semester				
Criterion	ECET107	ECET111	ECET114	MA153	ENG W131	ECET152	ECET146	MA154	PHYS218	COM114
2a	X	X	X			X	X			
2b			X	X		X	X	X	X	
2c							X		X	
2d							X			
2e	X	X				X	X		X	
2f				X			X	X		
2g			X		X					X
2h										
2i										
2j										
2k										

	3rd Semester					4th Semester				
Criterion	ECET204	ECET205	ECET264	MA227	MET157	ECET231	ECET303	ECET296	MA228	GenEd Area IV
2a	X	X	X			X	X	X		
2b	X	X	X	X	X	X	X	X	X	

2c	X	X				X	X	X			
2d							X	X			
2e	X	X				X	X	X			
2f	X	X	X	X	X	X	X	X	X		
2g								X		X	
2h											
2i										X	
2j										X	
2k								X			

	5th Semester					6th Semester				
Criterion	ECET307	ECET302	MA321	PHYS219		ECET357	ECET/CPET Elective	ENGW234	IET105	GenEd Area IV
2a	X	X	X	X		X	X		X	
2b	X	X	X	X		X	X		X	
2c	X	X		X		X	X			
2d		X					X			
2e		X								
2f	X	X	X	X		X	X			
2g								X	X	X
2h		X							X	
2i									X	X
2j								X		X
2k									X	

	7th Semester					8th Semester				
Criterion	ECET/CPET Elective	MA/SCI Elective	ECET490	GenEd Area III	Non-ECET Elective	ECET/CPET Elective	ECET491	ENGW421	Non-ECET Elective	GenEd Area V
2a	X		X			X	X			
2b	X	X	X		X	X	X		X	
2c	X		X			X	X			
2d	X		X			X	X			
2e			X				X			
2f	X		X			X	X			
2g				X			X	X		X
2h			X				X			
2i			X	X			X			X
2j				X						X
2k			X				X			

Appendix 2.

ECET 490 Senior Design Phase I - Assessment Form
Student Name: Date:
Project Title:
Project Type: Work related Non-work related

Project Selection (10%):
Technically challenging and potential benefits _____

Safety and reliability concerns _____
Initial research and source contact _____
Comments about the project selection _____
Project Planning and Management (50%):
Specification/Requirements _____
Periodic progress report _____
Time line and schedule _____
Feasibility study _____
Interaction with project advisor _____
Comments about the project operation _____
Project Design (10%): Modeling/simulation _____
Logging testing results and progress _____
Comments about the project operation _____
Report (20%):
Comments about report
Oral Presentation (10%):
Professionalism (include preparation and use of visual aids) _____
Familiarity with the project (include ability to answer questions) _____
Comments about the oral presentation
Evaluator: Grade:

Appendix 3.

ECET 491 Senior Design Phase II - Assessment Form
Student Name: _____
Project Title: _____ Date: _____
Project Type: Work related ___ Non-work related _____

Project Planning and Management (25%): _____
Specification/Requirements ____
Analysis Results _____
Periodic progress report _____
Time line and schedule _____
Interaction with project advisor _____
Comments about the project selection _____
Project Design (25%): _____
Modeling/Simulation _____
System Architecture _____
Logging testing results and progress _____
Comments about the project operation _____
Project Implementation/Operation (20%): _____
Meets or exceeds specifications _____
Test results available _____
Understanding of the project operation _____
Comments about the project operation _____
Oral Presentation (10%): ____
Professionalism (include preparation and use of visual aids) _____
Familiarity with the project (include ability to answer questions) _____
Comments about the oral presentation _____
Report (20%): _____
Comments about report _____
Evaluator: _____ Grade: _____