CLEVELAND STATE UNIVERSITY
DEPARTMENT OF ELECTRICAL AND COMPUTER ENGINEERING

Bachelor of Computer Engineering Program

ASSESSMENT ANNUAL REPORT

2009-2010 Academic Year
(08/2009 to 05/2010)

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I. Overview of Assessment Process

According to the Accreditation Board for Engineering and Technology (ABET) EC2000, the assessment process is an on-going spiral process that starts with the development of the objectives and outcomes, followed by annual assessment of the status of meeting the objectives and outcomes with all educational means, primarily the offering of courses, and, based on the assessment findings, subsequent adjustment of educational practice to better meet the objectives and outcomes. This process continues in a spiral manner in the sense that each cycle of the process is expected to result in a higher quality of education offered by the institution.

I.1 Assessment Methods

The Department of Electrical and Computer Engineering utilizes five distinct assessment tools: Course Evaluation, Senior Exit Survey, Design Instructor Survey, Alumni Survey, and Industry Advisory Committee Survey. Each one of these tools will be described in detail later.

Results collected by the five instruments are compiled and analyzed by the Engineering Criteria Department Coordinator. The compiled results are presented in the Annual Assessment Report to the department faculty for their review, and the faculty holds discussions about the findings. Weak points of the curriculum are identified and remedies are proposed.

A summary of the faculty review discussions and recommended remedial actions are compiled in the Reviews and Actions by the Engineering Criteria Department Coordinator and distributed to all faculty members of the department. Any recommended changes related to assessment methods and tools are made by the Engineering Criteria Department Coordinator. Any recommended changes related to courses are made by the respective course coordinators. Any recommended curriculum changes are officially brought before the Department, College and University for their approval.

Course Evaluation

This activity is performed at the end of each semester. Each course is designated to meet certain outcomes and objectives (see Courses/Outcomes Matrix in Section I.4 and Courses/Objectives in Section I.5). The instructor of each course is required to fill out a Course Evaluation Form for Outcomes and a Course Evaluation Form for Objectives (see Appendixes 9 and 10).

During fall semester 2006, the Course Evaluation Form for Outcomes was completely changed and redeveloped. This change was in response to a criticism by ABET as a result of its review of our BS programs in 2004 and a criticism by the CSU Office of Assessment in the 2005 Assessment Report Review. In the past, the course evaluation form for outcomes was rather subjective, lacking concrete measures for the success of meeting the program outcomes (see Appendixes 8 and 9 of 2004-2005 report). The new Course Evaluation Form for Outcomes follows the "rubrics" method for student learning assessment, as garnered from the Electrical and Computer Engineering Department Head Association by Dr. Villaseca, former department chairman. Each form is created by the course instructor using a set of student learning outcomes that are associated with a set of program outcomes for that course (see Appendix 8 for a sample form). The score for each student learning outcome is an average of the scores for relevant

quizzes, tests, exams, homework, etc. The score of each program outcome is an average of the scores for all student learning outcomes associated with that particular program outcome. This form greatly increases the objectiveness of the assessment since the measures for meeting the outcomes are direct and the instructors simply determine the "rubrics." The instructor makes appropriate changes in the course according to the indications of the assessment scores.

The Course Evaluation Form for Objectives (Appendix 10) uses a score from 0 to 3 points, as determined by the course instructor, for each objective. Scoring for meeting an objective (3 for "completely met" and 0 for "not met") is intended to be relative to the "extent [that objective is] intended for the course." Total number of points and the percentage of the maximum total number of points are calculated. On the form, the instructor is also provided a space to write any necessary explanation to support the evaluation, to provide an assessment of the students' knowledge of the prerequisite topics, and to provide recommendations on how to change the course in order to better meet the program outcomes and/or objectives.

As it is, the Course Evaluation Form for Objectives is rather subjective. The Engineering Criteria Department Coordinator is currently investigating possible ways to make it less subjective, perhaps similar to what was done for the Course Evaluation Form for Outcomes.

Senior Exit Survey

This activity is performed every year at the end of the spring semester. Each graduating senior student is asked to fill out a Senior Exit Survey Form (see Appendix 11). The forms are distributed and collected by one of the department secretaries. The student is first asked to answer three general questions about quality of the academic program, the courses, and the faculty. For these 3 questions, a score from 1 to 5 is given, with 1 for "poor" and 5 for "excellent." The student is then asked to answer 15 questions regarding whether, in their opinion, the outcomes of the curriculum are met. For these 15 questions, a score from 0 to 5 points is given, with 5 for "strongly agree," 1 for "strongly disagree," and 0 for "no basis for judgment." At the end, the student is asked to comment on the strength of the Computer Engineering program and on how the Computer Engineering program could be improved.

Senior Design Instructor Survey

This activity is ordinarily performed every year at the end of spring semester, unless senior design is offered in the fall, in which case it is also performed at the end of fall semester. Each instructor teaching the Senior Design course (EEC490) is asked to fill out a Senior Design Instructor Survey form (see Appendix 12). Forms are distributed to and collected from the instructors by the Engineering Criteria Department Coordinator.

The instructor is asked to answer 16 questions regarding the students' ability as stipulated by the outcomes of the curriculum, acquired through the curriculum, and manifested in the senior design process. For these 16 questions, a score from 0 to 5 points is given, with 5 for "excellent," 1 for "poor," and 0 for "no basis for judgment." At the end, the instructor is asked to recommend changes, if any, to the Senior Design course and/or to the curriculum of the Computer Engineering Program.

Alumni Survey

This activity is performed by the department every odd year at the end of the fall semester, with the responses collected throughout the following spring semester. Each surveyed alumnus is asked to (anonymously) fill out a form of 30 questions (see Appendix 13). Questions 2

I.2 Outcomes/Assessment Matrix

The assessment tools (strategies) include Course Evaluation (questionnaire), Senior Exit Survey (questionnaire), Design Instructor Survey (questionnaire), Alumni Survey (questionnaire), and Industry Advisory Committee (meetings). The outcomes and the assessment strategies for outcomes are summarized in the following table.

Outcomes / **Assessment Tools**	Course Evaluation (Questionnaire)	Senior Exit Survey (Questionnaire)	Design Instructor Survey (Questionnaire)	Alumni Survey (Questionnaire)	Industry Advisory Committee (Meetings)
(a) Apply knowledge of mathematics, science and engineering	✓	✓	✓	✓	✓
(b) Design and conduct computer engineering experiments, as well as analyze and interpret data	✓	✓	✓	✓	✓
(c) Design a system, component, or process to meet desired needs	✓	✓	✓	✓	✓
(d) Function on multi-disciplinary teams	✓	✓	✓	✓	✓
(e) Identify, formulate, and solve computer engineering problems	✓	✓	✓	✓	✓
(f) Understanding of professional and ethical responsibility	✓	✓	✓	✓	✓
(g) Communicate effectively	✓	✓	✓	✓	✓
(h) Understand the impact of engineering solutions in a global and societal context	✓	✓	✓	✓	✓
(i) Engage in life-long learning	✓	✓	✓	✓	✓
(j) Knowledge of contemporary issues	✓	✓	✓	✓	✓
(k) Use the techniques, skills, and modern engineering tools	✓	✓	✓	✓	✓

I.3 Objectives/Assessment Matrix

The assessment tools (strategies) include Course Evaluation (questionnaire), Alumni Survey (questionnaire), and Industry Advisory Committee (meetings). The objectives and the assessment strategies for objectives are summarized in the following table.

Objectives / **Assessment Tools**	Course Evaluation (Questionnaire)	Senior Exit Survey (Questionnaire)	Design Instructor Survey (Questionnaire)	Alumni Survey (Questionnaire)	Industry Advisory Committee (Meetings)
1) Practice computer engineering	✓			✓	✓
2) Define and diagnose problems, and provide and implement computer engineering solutions in an industrial environment	✓			✓	✓
3) Observe engineering ethics in the practice of computer engineering	✓			✓	✓
4) Communicate effectively with technically diverse audiences	✓			✓	✓
5) Collaborate with others as a member or as a leader in an engineering team	✓			✓	✓
6) Develop their knowledge beyond the undergraduate level and to keep current with advancements in computer engineering	✓			✓	✓

I.4 Courses/Outcomes Matrix

Year	Freshman							Sophomore									Junior									Senior						
Computer Engineering Program / **Outcome**	ENG 101/102 English I/II	MTH 181/182 Calculus I/II	CHM 261/266 General Chemistry I/Lab I	PHY 243 University Physics I (WAC)	ESC 100 & CSC 121 Orientation	CIS 260 Introduction to Programming	ESC 120 Introduction to Engineering	MTH 284 Matrices for Engineers	PHY 244 University Physics II (WAC)	ESC 250 Differential Equations	EEC 310/311 Electric Circuits I\II	EEC 313 Electronics I	CIS 265 Data Structures and Algorithms	CIS 334 Fundamentals of Microcomputer Arch.	CIS 340 C/C++ for Systems Programming	ESC 310 Statistics and Probability	General Education Elective	EEC 316 Electronic Devices Lab	EEC 382 Digital Systems and Lab	EEC 414 Writing in Electrical & Computer Engr.	CIS 345 Architecture and OS	MTH 220 Discrete Mathematics	EEC 483 Computer Organizations	ESC 282 Engineering Economy	PHL 215 Engineering Ethics (WAC)	ESC XXX Engineering Science Elective	General Education Electives (Three)	EEC 480/481 Modern Digital Design/Lab	EEC 482 Computer Engineering Lab	EEC 484 Computer Networks	EEC 485 High Performance Architectures	EEC 490 Senior Design	EEC Technical Electives (Three)	General Education Elective
(a) Knowledge of mathematics, science, and engineering		✓	✓	✓		✓		✓	✓	✓	✓	✓	✓	✓	✓	✓		✓	✓		✓	✓	✓	✓		✓		✓	✓	✓	✓	✓	✓	
(b) Design and conduct experiments, analyze and interpret data			✓	✓			✓		✓							✓		✓	✓									✓	✓			✓		
(c) Ability to design a system, component, or process						✓					✓	✓	✓	✓	✓			✓	✓		✓		✓					✓	✓	✓	✓	✓	✓	
(d) Ability to function on multi-disciplinary teams																																✓		
(e) Ability to identify, formulate, and solve computer engineering problems										✓				✓	✓				✓		✓		✓					✓	✓	✓	✓	✓	✓	
(f) Understanding of professional and ethical responsibility					✓		✓													✓					✓								
(g) Ability to communicate effectively	✓		✓	✓			✓		✓									✓	✓	✓					✓				✓			✓		
(h) Broad education to understand the impact of engineering solutions in a global and societal context																	✓			✓				✓	✓		✓						✓
(i) Recognition of the need for, and an ability to engage in life-long learning																	✓			✓							✓			✓	✓	✓	✓	✓
(j) Knowledge of contemporary issues																	✓								✓		✓						✓	
(k) Ability to use the techniques, skills, and modern engineering tools						✓					✓	✓	✓	✓	✓			✓	✓		✓		✓					✓	✓	✓	✓	✓	✓	

I.5 Courses/Objectives Matrix

Computer Engineering Program / Objective	Courses																		
	EEC 310 Electric Circuits I	EEC 311 Electric Circuits II	EEC 313 Electronics I	EEC 316 Electronics Lab	EEC 382 Digital Systems and Lab	EEC 414 Writing in Elect. & Comp. Engr.	EEC 417 Embedded Systems	EEC 430 Digital Signal Processing	EEC 440 Controls	EEC 442 Art and Sci. of Feedback Control	EEC 447 Advanced PLC Applications	EEC 450 Communications	EEC 480/481 Modern Digital Design/Lab	EEC 482 Computer Engineering Lab	EEC 483 Computer Organization	EEC 484 Computer Networks	EEC 485 High Performance Architectures	EEC 490 Senior Design	EEC 492 Special Topics in E&CE
1. Practice computer engineering in one or more of the following areas: communications, computers, controls, power electronics, and power systems.	✓	✓	✓	✓	✓		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
2. Define and diagnose problems, and provide and implement computer engineering solutions in industry, business, and government.	✓	✓	✓	✓	✓		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
3. Observe engineering ethics in the practice of computer engineering.						✓													
4. Communicate effectively with technically diverse audiences						✓												✓	
5. Collaborate with others as a member or as a leader in an engineering team.				✓	✓		✓		✓				✓	✓	✓		✓	✓	
6. Develop their knowledge beyond the undergraduate level and to keep current with advancements in computer engineering.						✓			✓	✓									

I.6 Outcomes/Objectives Matrix

The long term program objectives are impacted by the shorter term program outcomes. The following table summarizes the level of impact each outcome has on a given objective.

Impacting Outcomes / Objectives	(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)	(k)
1	3	3	3	2	3	2	2	2	1	1	3
2	3	3	3	2	3	2	2	2			3
3						3		2			
4							3			2	
5				3		2	3				
6								1	3	3	

3: The outcome has a direct impact on the objective.
2: The outcome has a moderate impact on the objective.
1: The outcome has a slight impact on the objective.

II. Assessment Results Relative to Outcomes

Scores are percentages that are obtained by normalizing scores to their maximums. The designations are:

- 90 to 100: Excellent
- 80 to 90: Very Good
- 70 to 80: Good
- 60 to 70: Satisfactory
- < 60: Unsatisfactory

The following table is a summary of the overall average scores of all outcomes. The overall average score is an average of scores obtained by various assessment tools during two semesters. (See Appendixes 1 to 8 for detailed results from Course Evaluations, Senior Exit Survey, Senior Design Instructor Survey and Alumni Survey).

Outcomes	Overall Average Score (%) 2009-2010	Designation	Overall Average Score (%) 2008-2009
(a) Ability to apply knowledge of mathematics, science, and engineering	80	Very good	82
(b) Ability to design and conduct computer engineering experiments	81	Very good	78
(c) Ability to design a system, component, or process to meet desired needs	78	Good	88
(d) Ability to function on multi-disciplinary teams	77	Good	82
(e) Ability to identify, formulate, and solve computer engineering problems	81	Very good	83
(f) Understanding of professional and ethical responsibility	81	Very good	79
(g) Ability to communicate effectively	85	Very good	77
(h) Broad education to understand the impact of engineering solutions in a global and societal context	66	Satisfactory	82
(i) A recognition of the need for, and an ability to engage in life-long learning	71	Good	81
(j) A knowledge of contemporary issues	69	Satisfactory	82
(k) An ability to use the techniques, skills, and modern engineering tools necessary for computer engineering practice	84	Very good	87

Please note that the Industry Advisory Committee results have not been included during the 2009-2010 academic year since their report is not yet available as of this writing.

From the summary table we can see that our program in general is successful in meeting the outcomes. In fact, six out of the eleven Outcomes currently have the "Very good" designation, three Outcomes, the "Good" designation, with two of them at the high "Good" range, and two Outcomes, the high "Satisfactory" designation.

Compared with the 2008-2009 results, we can see that the scores for Outcomes (a), (b), (e), (f) and (k) have stayed about the same, Outcome (g) showed appreciable improvement, Outcomes (c), (d) and (i) showed some reduction, and Outcomes (h) and (j) showed noticeable reductions.

Again, compared with the 2008-2009 results, Outcomes (b), (f) and (g) have improved from a "Good" designation to a "Very good" designation while Outcomes (c), (d) and (i) degraded in designation from "Very good" to "Good," and Outcomes (h) and (j) degraded from "Very good" to "Satisfactory." However, it is interesting to note that in the 2008-2009 report, Outcomes (b), (f) and (g) had degraded in designation from "Very good" to "Good" while Outcomes (h) and (j) had improved from a "Good" to a "Very good" designation, with about a 10-point increase in their scores. This seems to suggest some cyclic nature in scores from year to year, which may be due to cyclic inclusion of the Alumni Survey results into the analyses.

While the decline in Outcomes (h) and (j) from "Very good" to "Satisfactory" might seem like a significant concern, it arises mainly from the significantly low scores given by a single Senior Design Instructor Survey in the case of both Outcomes (h) and (j), and low scores from the Alumni Survey in the case of Outcome (j). While a single Senior Design Instructor Survey may not be statistically significant, the low Alumni Survey score in the case of Outcome (j) is a concern. It should however be understood that the Alumni Survey results lag programmatic improvements by several years on average, and that the recent restructuring of the university general education requirements is expected to significantly improve Outcome (j).

In the following, detailed scores for each outcome are presented (if an assessment instrument is not available, no entry is shown in the score table.) Then, conclusions are drawn from the scores and necessary actions are recommended or actions already taken are described.

<u>Outcome (a)</u>: Ability to apply knowledge of mathematics, science, and engineering to general computer engineering and, in particular, to one or more of the following areas: communications, computers, controls, power electronics, and power systems.

This outcome is to be realized by all EEC courses and supporting engineering science (ESC) courses. It also relies heavily on the background acquired by the students during their first two years of study in the courses taken from the departments of Mathematics, Physics and Chemistry.

Results of Outcome (a):

Scores / Assessment Strategy	Fall 2009	Spring 2010	Average of the year	Designation
Course Evaluation	74	80	77	Good
Senior Exit Survey		90	90	Excellent
Senior Design Instructor Survey		73	73	Good
Alumni Survey		80	80	Very good
Industry Advisory Committee				
Overall Average			**80**	**Very good**

Conclusions and Actions Taken/Recommended:

The overall average score is "very good" suggesting that this outcome has been met. While the scores from Course Evaluation and Alumni Survey are pretty close, around the "Good" mark, the score from the Senior Exit survey is appreciably higher and the score from Senior Design Instructor Survey is lower. This might be an indication that this score matures over the course of a student's four-year education, resulting in a higher score from graduating seniors.

The individual scores for EEC 310 (F09 and S10), EEC 311 (F09), EEC 313 (F09) and EEC 450 (F09) are below 70 (see Appendixes 1 and 3). It is recommended that these courses are enhanced for this outcome.

Outcome (b): Ability to design and conduct computer engineering experiments, as well as to analyze and interpret data

This outcome is to be realized by all EEC laboratory courses as well as some other EEC courses.

Results of Outcome (b):

Scores / Assessment Strategy	Fall 2009	Spring 2010	Average of the year	Designation
Course Evaluation	85	86	86	Very good
Senior Exit Survey		90	90	Excellent
Senior Design Instructor Survey		70	70	Good
Alumni Survey		78	78	Good
Industry Advisory Committee				
Overall Average			**81**	**Very good**

Conclusions and Actions Taken/Recommended:

The overall average score is a high "very good" suggesting that this outcome has been met. Scores from the Senior Exit Survey is lower than the other three assessment tools, while the score from the Senior Design instructor survey is low.

Our teaching laboratories have been undergoing continuous enhancement through purchasing new instruments and adding computers for laboratory use. Other changes in the curriculum, in particular, tighter coordination between lecture and corresponding laboratory courses, or integration thereof have resulted in greatly enhanced learning experience for our students.

The department has performs yearly inventories for several of its instructional laboratories. Plans have been put into action for the repair or replacement of defective instruments and components. However, there has been an ongoing need for a technician supporting the instructional laboratories.

Outcome (c): Ability to design a system, component, or process to meet desired needs

This outcome is to be realized by all EEC courses.

Results of Outcome (c):

Scores / Assessment Strategy	Fall 2009	Spring 2010	Average of the year	Designation
Course Evaluation	78	79	79	Good
Senior Exit Survey		80	80	Very good
Senior Design Instructor Survey		80	80	Very good
Alumni Survey		74	74	Good
Industry Advisory Committee				
Overall Average			**78**	**Good**

Conclusions and Actions Taken/Recommended:

The overall average score is "good" suggesting that this outcome has been met. However, the individual Course Evaluation scores for EEC 310 (S10), EEC 311 (S10) and EEC 313 (F09) are below 70 (see Appendixes 1 and 3). It is recommended that these courses are enhanced with design content.

Outcome (d): Ability to function on multi-disciplinary teams

This outcome is to be realized by EEC 490, Senior Design course, and summer projects.

Results of Outcome (d):

Scores / Assessment Strategy	Fall 2009	Spring 2010	Average of the year	Designation
Course Evaluation		80	80	Very good
Senior Exit Survey		70	70	Good
Senior Design Instructor Survey		80	80	Very good
Alumni Survey		77	77	Good
Industry Advisory Committee				
Overall Average			**77**	**Good**

Conclusions and Actions Taken/Recommended:

The overall average score is "good" suggesting that this outcome has been met. However, there is a marked discrepancy between the Senior Exit Survey scores and the other three assessment tool scores, which needs to be investigated.

Senior design is the only course where a multidisciplinary team is possible. Fall 2002 semester was the first time when a multi-disciplinary team was formed. A view, also shared by the Industry Advisory Committee, has developed over the years among the senior design instructors: "It is not indispensable to involve students from different degree program disciplines to have multidisciplinary teams if the Design Project itself requires students to deal with problems outside their own disciplinary degree program."

This year, senior design course in computer engineering had one section in the area of Digital Systems. The design projects were of multi-disciplinary nature even though students were not from different degree programs.

Outcome (e): Ability to identify, formulate, and solve computer engineering problems

This outcome is to be realized primarily by higher level EEC courses (including, but not limited to 400-level courses).

Results of Outcome (e):

Scores / Assessment Strategy	Fall 2009	Spring 2010	Average of the year	Designation
Course Evaluation	81	86	84	Very good
Senior Exit Survey		80	80	Very good
Senior Design Instructor Survey		80	80	Very good
Alumni Survey		79	79	Good
Industry Advisory Committee				
Overall Average			**81**	**Very good**

Conclusions and Actions Taken/Recommended:

The overall average score is "good" suggesting that this outcome has been met. There is also a good correlation between the scores from all four assessment tools used.

Outcome (f): Understanding of professional and ethical responsibility

This outcome is to be realized by ESC 100 Orientation, ESC 120 Introduction to Engineering, EEC 414 Writing in Electrical and Computer Engineering and PHL 215 Engineering Ethics.

Results of Outcome (f):

Scores / Assessment Strategy	Fall 2009	Spring 2010	Average of the year	Designation
Course Evaluation				
Senior Exit Survey		80	80	Very good
Senior Design Instructor Survey		80	80	Very good
Alumni Survey		82	82	Very good
Industry Advisory Committee				
Overall Average			**81**	**Very good**

Conclusions and Actions Taken/Recommended:

The overall average score is "very good" suggesting that this outcome has been met. There is very good correlation between the scores from all three assessment tools used. It was recommended in the 2003/2004 report that course evaluations be conducted on the relevant courses, ESC100, ESC120 and PHL215, so that the overall score could be more accurate.

Over the years, it has been extremely difficult, if not impossible, to collect course evaluations from out-of-department courses. This year, no course evaluation data supporting Outcome (f) has been collected. It is recommended that alternative assessment methods are investigated unless Course Evaluation data can be reliably collected from out-of-department courses.

Outcome (g): Ability to communicate effectively

This outcome is to be realized primarily by EEC lab courses, EEC 490 and PHL215.

Results of Outcome (g):

Scores / Assessment Strategy	Fall 2009	Spring 2010	Average of the year	Designation
Course Evaluation	100	86	93	Excellent
Senior Exit Survey		90	90	Very good
Senior Design Instructor Survey		80	80	Very good
Alumni Survey		75	75	Good
Industry Advisory Committee				
Overall Average			**85**	**Very good**

Conclusions and Actions Taken/Recommended:

The overall average score is "very good" suggesting that this outcome has been met. While the Course Evaluation and Senior Exit Survey scores match pretty well, scores from the other two assessment tools are markedly lower.

This outcome was initially addressed quite effectively by the integration into the program of Proskills (formerly Write-Talk) provided by Watson Associates and sustained by many of our instructors. Proskills was first experimentally introduced in fall 2002 and formally implemented in spring 2003. The Proskills program was a communication skill development program designed to address many of the most important communication and interpersonal skills required for successful carriers in engineering. The program targeted the development of non-technical skills such as writing, speaking, ethics, personal networking, resumes and cover letters, project management, teamwork, interpersonal relationships, etc.

While the Proskills program has been in place for EEC 490 Senior Design courses during spring 2010, it can no longer be reliably sustained due to a lack of funds. In order to address this outcome, the department has recently introduced a formal course, EEC 414 Writing in Electrical and Computer Engineering, which was first offered during spring 2009. Students enrolled in EEC 414 must be concurrently enrolled in any content-based ECE course, excluding lab courses and senior design. In addition to various topics such as research proposals and resumes, EEC 414 evaluates and provides feedback on writing assignments provided by the content course. EEC 414 will become a required course starting fall 2010.

Outcome (h): Broad education to understand the impact of engineering solutions in a global and societal context

This outcome is to be realized by the general education electives, and ESC 282 Engineering Economy and PHL 215 Engineering Ethics.

Results of Outcome (h):

Scores / Assessment Strategy	Fall 2009	Spring 2010	Average of the year	Designation
Course Evaluation				
Senior Exit Survey		70	70	Good
Senior Design Instructor Survey		60	60	Satisfactory
Alumni Survey		68	68	Satisfactory
Industry Advisory Committee				
Overall Average			**66**	**Satisfactory**

Conclusions and Actions Taken/Recommended:

The overall average score is "satisfactory" suggesting that this outcome has been met. As mentioned under Outcome (f), it is very difficult to obtain course evaluations from out-of-department courses, especially courses as diverse as general education electives. This year, no Course Evaluation data regarding Outcome (h) has been collected. It is therefore recommended that alternative assessment methods are investigated unless Course Evaluation data can be reliably collected from at least ESC 282 and PHL 215.

The score from Senior Design Instructor Survey is markedly below those from Alumni Survey and Senior Exit Survey, which needs to be investigated.

Outcome (i): Recognition of the need for, and an ability to engage in life-long learning

This outcome is to be realized by general education electives, EEC490 Senior Design and EEC technical electives.

Results of Outcome (i):

Scores / Assessment Strategy	Fall 2009	Spring 2010	Average of the year	Designation
Course Evaluation	91	79	85	Very good
Senior Exit Survey				
Senior Design Instructor Survey		60	60	Satisfactory
Alumni Survey		68	68	Satisfactory
Industry Advisory Committee				
Overall Average			**71**	**Good**

Conclusions and Actions Taken/Recommended:

The overall average score is "good" suggesting that this outcome has been met. However, scores from Senior Design Instructor Survey and Alumni Survey are markedly below that from Course Evaluation, which needs to be investigated.

Outcome (j): Knowledge of contemporary issues

This outcome is to be realized by general education electives and PHL215 Engineering Ethics.

Results of Outcome (j):

Scores / Assessment Strategy	Fall 2009	Spring 2010	Average of the year	Designation
Course Evaluation	87		87	Very good
Senior Exit Survey				
Senior Design Instructor Survey		60	60	Satisfactory
Alumni Survey		61	61	Satisfactory
Industry Advisory Committee				
Overall Average			**69**	**Satisfactory**

Conclusions and Actions Taken/Recommended:

The overall average score is "satisfactory" suggesting that this outcome has been met. It is, however, recommended that alternative assessment methods are investigated unless Course Evaluation data can be reliably collected from and PHL 215.

However, like Outcomes (i), scores from Senior Design Instructor Survey and Alumni Survey are markedly below that from Course Evaluation.

It is expected that the new general education structure adopted by the University will improve the attainment level of this outcome.

Outcome (k): An ability to use the techniques, skills, and modern engineering tools necessary for computer engineering practice

This outcome is to be realized by all EEC courses.

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Results of Outcome (k):

Scores / Assessment Strategy	Fall 2009	Spring 2010	Average of the year	Designation
Course Evaluation	82	82	82	Very good
Senior Exit Survey		80	80	Very good
Senior Design Instructor Survey		100	100	Excellent
Alumni Survey		72	72	Good
Industry Advisory Committee				
Overall Average			**84**	**Very good**

Conclusions and Actions Taken/Recommended:

The overall average score is "very good" suggesting that this outcome has been met. However, the individual Course Evaluation scores for EEC 310 (S10), EEC 311 (F09) and EEC 430 (F09) are particularly low. It is recommended that these courses are enhanced regarding Outcome (k).

III. Summary of Assessment Results Relative to Objectives

Scores are percentages that are obtained by normalizing scores to their maximums. The designations are:

- 90 to 100: Excellent
- 80 to 90: Very Good
- 70 to 80: Good
- 60 to 70: Satisfactory
- < 60: Unsatisfactory

According to our assessment strategies, success in objectives is assessed through the use of Course Evaluations, Alumni Survey and Industry Advisory Committee meetings. The Industry Advisory Committee has met during spring 2010; however, their report is not available as of this writing. Therefore, the scores for objectives are based only on the fall 2009 and spring 2010 Course Evaluations and Alumni Survey results (See Appendixes 2, 4 and 8). The following is a table that summarizes the results (all scores are normalized percentages).

Objectives	Alumni Survey 2009-2010	Fall 09 Course Evaluation	Spring 10 Course Evaluation	Overall Average Score (%) 2009-2010	Designation	Overall Average Score (%) 2008-2009
1) Practice computer engineering in one or more of the following areas: communications, computers, controls, power electronics, and power systems	85	97	100	**94**	**Excellent**	91
2) Define and diagnose problems, and provide and implement computer engineering solutions in industry, business, and government	88	80	83	**84**	**Very good**	82
3) Observe engineering ethics in the practice of computer engineering		100	67	**84**	**Very good**	100
4) Communicate effectively with technically diverse audiences	85		67	**76**	**Good**	67
5) Collaborate with others as a member or as a leader in an engineering team	92	58	67	**72**	**Good**	76
6) Develop their knowledge beyond the undergraduate level and to keep current with advancements in computer engineering	81	67		**74**	**Good**	88

IV. Conclusions and Further Actions

From above assessment results and analyses, we can conclude that our Program of Bachelor of Computer Engineering has met all outcomes and objectives in the academic year 2009-2010.

From the summary table we can see that our program in general is successful in meeting the outcomes. In fact, six out of the eleven Outcomes currently have the "Very good" designation, three Outcomes, the "Good" designation, with two of them at the high "Good" range, and two Outcomes, the high "Satisfactory" designation.

From the outcomes results summary table, we can see that compared with the 2008-2009 results, the scores for Outcomes (a), (b), (e), (f) and (k) have stayed about the same, Outcome (g) showed appreciable improvement, Outcomes (c), (d) and (i) showed some reduction, and Outcomes (h) and (j) showed noticeable reductions.

While the decline in Outcomes (h) and (j) from "Very good" to "Satisfactory" might seem like a significant concern, it arises mainly from the significantly low scores given by a single Senior Design Instructor Survey in the case of both Outcomes (h) and (j), and low scores from the Alumni Survey in the case of Outcome (j). While a single Senior Design Instructor Survey may not be statistically significant, the low Alumni Survey score in the case of Outcome (j) is a concern. It should however be understood that the Alumni Survey results lag programmatic improvements by several years on average, and that the recent restructuring of the university general education requirements is expected to significantly improve Outcome (j).

From the objectives result summary table, we see that the scores for Objectives (1), (2) and (5) remained relatively steady, Objective (4) improved from "Satisfactory" to "Good," with an increase of nine points, Objectives (3) declined from "Excellent" to "Very Good" and Objective (6) declined significantly from "Very good" to "Good." Compared to previous year's report, it appears that the decline in Objective (4) from "Good" to "Satisfactory" has been reversed during the 2009-2010 academic year.

It should be noted that Objective (3) is assessed by the scores from a single course for both fall 2009 and spring 2010 during the current year. Raw scores of 3 and 2 out of 3, respectively for the two semesters, create the overall score for Objective (3) when converted to percentages. Therefore, Objective (3) score is considered to be statistically not significant, and does not constitute a major concern.

While the rating for Objective (6) appears to be declining, it still achieves a "Good" designation. Furthermore, the score from Alumni Survey, at 81, should provide a better indication of the achievement of Objective (6), "Develop[ing] their knowledge beyond the undergraduate level and to keep current with advancements in electrical engineering," than what can be accessed through course evaluations, measured at 67 for fall 2009 semester. Therefore, the apparent decline in this score is not a major concern either.

A main concern for both the Outcomes Assessment and Objectives Assessment is the ongoing absence of Industry Advisory Committee results from the assessment reports. Over the years, Industry Advisory Committee reports have usually arrived too late to be included in the assessment reports, and when they did, they did not include any quantitative measures that could be integrated as scores. This remains an issue yet to be resolved.

The Department is continuing in its efforts to improve the quality of education by following ABET EC 2000 guidelines and "Vision 2010," a resolution outlining the principles of improving teaching passed by department faculty in October 2005. That document was initiated to address the perceived problems of our way of educating our students, and it is in line with ABET EC2000. The spirit of the document involves the implementation of "problem-oriented teaching and active learning," and "early-on and hands-on" principles for the undergraduate curricula programs.

Implementation of proposed issues in Vision 2010 is mostly completed. The following changes in the computer engineering curriculum have been approved during the 2009-2010 academic year in support of Vision 2010 and in line with the joint IEEE Computer Society/ACM Task Force recommendations on "Model Curricula for Computing":

- EEC 315 Electronics Laboratory has since been replaced by EEC 316 Electronic Devices Laboratory in order to eliminate prerequisite conflicts.
- One general education course has been dropped from the curricula since we no longer need five general education courses, due to a complete reorganization and restructuring of general education requirements by the University. This provides room for additional major courses.
- A number of courses have been moved around in the schedule to accommodate the addition and removal of courses and to facilitate "early on hands on" education.
- EEC 310 Circuits I and EEC 311 Circuits II have been improved to better address our students' needs, in 2009.
- ESC 120 Introduction to Engineering Design course has been enhanced with the addition of two new modules, Computer Skills and Computer Engineering.
- Two members of the faculty have prepared a new course on iPhone application development for fall 2010 implementation (as a tech elective course for undergraduate students, and as a graduate course), made possible by a Teaching Enhancement Award from the CSU Center for Teaching Excellence in 2009.

APPENDIXES

Appendix 1 Course Evaluation Results for Outcomes, Fall 2009

Course No.	Course Description	Cr.	(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)	(k)	Average (%)
Computer Engineering Courses														
EEC 310	*Electric Circuits I*													
EEC 311	*Electric Circuits II*													
EEC 313	*Electronics I*													
EEC 316	*Electronic Devices Lab*													*Not submitted*
EEC 382	*Digital Systems and Lab*													
EEC 480/481	*Modern Digital Design/Lab*													
EEC 482	*Computer Engineering Lab*													*Not offered*
EEC 483	*Computer Organization*													*Not offered*
EEC 484	*Computer Networks CE*													
EEC 485	*High Perf. Comp. Arch. CE*													
EEC 490	*Senior Design*													*Not offered*
Computer Engineering EEC Electives														
EEC 417	*Embedded Systems*													*Not offered*
EEC 421	*Software Engineering*													*No undergrads*
EEC 430	*Digital Signal Processing*													
EEC 440	*Controls*													
EEC 447	*Applications of PLCs*													*Not offered*
EEC 450	*Communications*													
Other Courses														
ESC 120	*Introduction to Eng. Design*													*Not collected*
PHL 215	*Engineering Ethics*													*Not collected*
ESC 282	*Engineering Economy*													*Not collected*
	Average Score (%)		**74.2**	**85.0**	**78.3**		**80.9**		**100**		**90.7**	**87.0**	**82.2**	***84.8***

Appendix 2 Course Evaluation Results for Objectives, Fall 2009

Course No.	Course Description	Cr.	1	2	3	4	5	6	Average (%)
Computer Engineering Courses									
EEC 310	*Electric Circuits I*								
EEC 311	*Electric Circuits II*								
EEC 313	*Electronics I*								
EEC 316	*Electronic Devices Lab*								*Not submitted*
EEC 382	*Digital Systems and Lab*								
EEC 480/481	*Modern Digital Design/Lab*								
EEC 482	*Computer Engineering Lab*								*Not offered*
EEC 483	*Computer Organization*								*Not offered*
EEC 484	*Computer Networks CE*								
EEC 485	*High Perf. Comp. Arch. CE*								
EEC 490	*Senior Design*								*Not offered*
Computer Engineering EEC Electives									
EEC 417	*Embedded Systems*								*Not offered*
EEC 421	*Software Engineering*								*No undergrads*
EEC 430	*Digital Signal Processing*								
EEC 440	*Controls*								
EEC 447	*Applications of PLCs*								*Not offered*
EEC 450	*Communications*								
Other Courses									
ESC 120	*Introduction to Eng. Design*								*Not collected*
PHL 215	*Engineering Ethics*								*Not collected*
ESC 282	*Engineering Economy*								*Not collected*
	Average Score (%)		**96.7**	**80.0**	**100.0**		**58.3**	**66.7**	**80.3**

Appendix 3 Course Evaluation Results for Outcomes, Spring 2010

Course No.	Course Description	Cr.	(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)	(k)	Average (%)
Computer Engineering Courses														
EEC 310	*Electric Circuits I*													
EEC 311	*Electric Circuits II*													
EEC 313	*Electronics I*													
EEC 316	*Electronic Devices Lab*													
EEC 382	*Digital Systems and Lab*													*Not offered*
EEC 480/481	*Modern Digital Design/Lab*													*Not offered*
EEC 482	*Computer Engineering Lab*													
EEC 483	*Computer Organization*													
EEC 484	*Computer Networks CE*													*Not enough data*
EEC 485	*High Perf. Comp. Arch. CE*													*Not offered*
EEC 490	*Senior Design (5)*													
Computer Engineering EEC Electives														
EEC 417	*Embedded Systems*													
EEC 421	*Software Engineering*													*Not offered*
EEC 430	*Digital Signal Processing*													*Not offered*
EEC 440	*Controls*													*Not offered*
EEC 447	*Applications of PLCs*													*Not submitted*
EEC 450	*Communications*													*Not offered*
Other Courses														
ESC 120	*Introduction to Eng. Design*													*Not collected*
PHL 215	*Engineering Ethics*													*Not collected*
ESC 282	*Engineering Economy*													*Not collected*
	Average Score (%)		**80.1**	**85.5**	**78.5**	**80.0**	**85.7**		**86.3**		**79.0**		**82.1**	***82.1***

Appendix 4 Course Evaluation Results for Objectives, Spring 2010

Course No.	Course Description	Cr.	1	2	3	4	5	6	Average (%)
Computer Engineering Courses									
EEC 310	*Electric Circuits I*								
EEC 311	*Electric Circuits II*								
EEC 313	*Electronics I*								
EEC 316	*Electronic Devices Lab*								
EEC 382	*Digital Systems and Lab*								*Not offered*
EEC 480/481	*Modern Digital Design/Lab*								*Not offered*
EEC 482	*Computer Engineering Lab*								
EEC 483	*Computer Organization*								
EEC 484	*Computer Networks CE*								*Not enough data*
EEC 485	*High Perf. Comp. Arch. CE*								*Not offered*
EEC 490	*Senior Design (5)*								
Computer Engineering EEC Electives									
EEC 417	*Embedded Systems*								
EEC 421	*Software Engineering*								*Not offered*
EEC 430	*Digital Signal Processing*								*Not offered*
EEC 440	*Controls*								*Not offered*
EEC 447	*Applications of PLCs*								*Not submitted*
EEC 450	*Communications*								*Not offered*
Other Courses									
ESC 120	*Introduction to Eng. Design*								*Not collected*
PHL 215	*Engineering Ethics*								*Not collected*
ESC 282	*Engineering Economy*								*Not collected*
	Average Score (%)		**100.0**	**83.3**	**66.7**	**66.7**	**66.7**		**76.7**

Appendix 5 Senior Exit Survey Results for Outcomes, Spring 2010

		Relative Score							
		5	*4*	*3*	*2*	*1*	*N/A*		
Outcome	*Survey Question Number*	Frequency						*Question Score*	*Outcome Score*
(a)									90%
(b)									90%
(c)									80%
(d)									70%
(e)									80%
(f)									80%
(g)									90%
(h)									70%
(i)									
(j)									
(k)									80%
AVERAGE									81%

Appendix 6 Senior Design Instructor Survey Results for Outcomes, Spring 2010

		Relative Score							
		5	4	3	2	1	N/A		
Outcome	Survey Question Number	Frequency						Question Score	Outcome Score
(a)									73%
(b)									70%
(c)									80%
(d)									80%
(e)									80%
(f)									80%
(g)									80%
(h)									60%
(i)									60%
(j)									60%
(k)									100%
AVERAGE									75%

Appendix 7 Alumni Survey Results for Outcomes, 2009-2010

		Relative Score							
		5	*4*	*3*	*2*	*1*	*N/A*		
Outcome	*Survey Question Number*	Frequency						*Question Score*	*Outcome Score*
(a)									80%
(b)									78%
(c)									74%
(d)									77%
(e)									79%
(f)									82%
(g)									75%
(h)									68%
(i)									68%
(j)									61%
(k)									72%
Average									74%

Appendix 8 Alumni Survey Results for Objectives, 2009-2010

Objective	Survey Question Number	Relative Score								Question Score	Objective Score
		7	6	5	4	3	2	1	0		
(1)					Unempl.	Non-Eng.	Oth. Eng.	EE/CE			85%
										85%	
		Total Number of Responsibilities Frequency									
										87%	
		EE/CE with Any Listed Responsibility							Other		
										85%	
(2)					Unempl.	Non-Eng.	Oth. Eng.	EE/CE			88%
										88%	
(4)								Yes	No		85%
										73%	
										77%	
										85%	
(5)						Ext. All	Ext. Within	Minimal			92%
										92%	
(6)			Total Number of Activities Frequency								81%
										93%	
			Any Activity						No Actvty		
										81%	

Appendix 9 A Sample Course Evaluation Form for Outcomes

This form has similar style but different contents for each course. Shown below is a sample from EEC 484 Computer Networks.

EEC 484 Computer Networks Fall 2006

Quantitative Measure of Students Success in Mastering Outcomes

Program Outcome	Student Learning Outcome	Method of Assessment Assignment/Problem	Average Score (%)	Program Outcome Score (%)
(a) Knowledge of mathematics, science, and engineering	**Outcome 1**: An ability to understand protocol design principles and computer networks reference models	Quiz 1: Problems 1,2.1-2.6, 2.9-2.15	85.2	87.8
	Outcome 2: An ability to understand error detection and correction code	Quiz 2: Problem 2.1, 2.2, 2.3, Problem 5 (M W session)	93.6	
	Outcome 3: An ability to understand medium access control methods	Quiz 2: Problem 2.4-2.8, 2.13, 2.14, Problem 5 (T Th session)	64.0	
	Outcome 4: An ability to understand the role of standards in computer networks	Quiz 1: Problem 2.7, 2.8	92.5	
	Outcome 5: An ability to understand routing protocols	Quiz 3: Problems 2, 3, 4	93.1	
	Outcome 6: An ability to understand flow control and congestion control methods	Quiz 4 Problems 1, 4	98.1	
(c) Ability to design a system, component, or proc.	**Outcome 7**: An ability to design simple reliable communication protocols	Project	100	100
(e) Ability to identify, formulate, and solve computer engineering problems	**Outcome 8**: An ability to estimate the benefit of applying the proxy technology to increase the network throughput and reduce latency	Quiz 1 Problem 3	87.9	84.3
	Outcome 9: An ability to calculate the maximum data rate in a physical medium	Quiz 1 Problem 4	56.4	
	Outcome 10: An ability to determine IP address block allocation according to CIDR and IP fragmentation	Quiz 3 Problem 5 (MW session)	98.0	
	Outcome 11: An ability to calculate how to fragment an IP packet at a router	Quiz 3 Problem 5 (TTh session)	94.8	
(i) Recognition of the need for, and an ability to engage in life-long learning	**Outcome 12:** An ability to research topics not fully covered in class and to learn programming skills necessary to complete course project	Course Project	100	100
(k) Ability to use the techniques, skills, and modern engineering tools	**Outcome 13**: An ability to use tools (i.e., Ethereal, Web browser, DOS utilities) to perform traffic analysis for the following protocols: HTTP, DNS, TCP, IP, ICMP, Ethernet, DHCP, ARP	Labs 1-5	100	100

Appendix 10 Course Evaluation Form for Objectives

ABET Course Evaluation for Computer Engineering Objectives by Instructor

Course number and name _____Term and year_____

For the following objectives, check the items that are specified for the course. Then for each objective that is checked, evaluate the level to which you believe that objective was met *to the extent intended for the course*. The total number of points is the sum of all points of the checked items in the table. The maximum total number of points is the maximum number of points for all checked items in column one.

	Objective	Completely (3)	Mostly (2)	Somewhat (1)	Not met (0)
(1) ☐	Practice computer engineering	☐	☐	☐	☐
(2) ☐	Define and diagnose problems, and provide and implement computer engineering solutions in industry, business, and government	☐	☐	☐	☐
(3) ☐	Observe engineering ethics in the practice of computer engineering	☐	☐	☐	☐
(4) ☐	Communicate effectively with technically diverse audiences	☐	☐	☐	☐
(5) ☐	Collaborate with others as a member or as a leader in an engineering team	☐	☐	☐	☐
(6) ☐	Develop their knowledge beyond the undergraduate level and to keep current with advancements in computer engineering	☐	☐	☐	☐
	Total Number of Points				
	Percentage of the Maximum Total Number of Points				

In the space below, provide any necessary explanation to support your evaluation given above. If relevant, also provide an assessment of the students' knowledge of the prerequisite topics. Provide recommendations on how you should change the course in order to better meet the program objectives. Please type.

Evaluated by: _____

Signature: _____ Date: _____

Appendix 11 Senior Exit Survey Sheet (version 2, revised 4/23/03)

Department of Electrical and Computer Engineering

Senior Exit Survey for Computer Engineering

1 In general, the department has provided a _____ quality academic program?

Excellent				Poor
5	4	3	2	1

2 The Electrical & Computer Engineering courses are of _____academic quality.

Excellent				Poor
5	4	3	2	1

3 The Electrical & Computer Engineering faculty are

Excellent				Poor
5	4	3	2	1

In my studies of Computer Engineering at Cleveland State University I have:	**Strongly Agree**				**Strongly Disagree**	**No Basis for Judgment**
4. Gained the ability to apply knowledge of mathematics.	5	4	3	2	1	0
5. Gained the ability to apply knowledge of science.	5	4	3	2	1	0
6. Gained the ability to apply knowledge of engineering.	5	4	3	2	1	0
7. Gained the ability to design and conduct experiments, as well as to analyze and interpret data	5	4	3	2	1	0
8. Gained the ability to design a system, component, or process to meet desired needs.	5	4	3	2	1	0
9. Gained the ability to function on multi-disciplinary teams	5	4	3	2	1	0
10. Gained the ability to identify, formulate, and solve engineering problems.	5	4	3	2	1	0
11. Gained the understanding of professional and ethical responsibility.	5	4	3	2	1	0
12. Gained the ability to communicate effectively in oral presentations.	5	4	3	2	1	0
13. Gained the ability to communicate effectively in writing.	5	4	3	2	1	0
14. Gained the broad education necessary to understand of the impact engineering solutions in a global and societal context	5	4	3	2	1	0

15. Gained a recognition of the need for, and an ability to engage in life-long learning	5	4	3	2	1	0
16. Gained a knowledge of contemporary issues	5	4	3	2	1	0
17. Gained the ability to use computers and modern software packages as problem-solving tools.	5	4	3	2	1	0
18. Gained the ability to use reference materials to solve problems.	5	4	3	2	1	0

Comments on the strength of the Computer Engineering program.

Comments on how the Computer Engineering program could be improved.

Appendix 12 Senior Design Instructor Survey Sheet (version 2, revised 4/23/03)

Cleveland State University
Department of Electrical and Computer Engineering

Assessment Survey for the Faculty Teaching Senior Design for Computer Engineering

	Excellent	Above Average	Average	Below Average	Poor	No Basis for Judgment
1. The students' ability to apply knowledge of mathematics	5	4	3	2	1	0
2. The students' ability to apply knowledge of science	5	4	3	2	1	0
3. The students' ability to apply knowledge of engineering	5	4	3	2	1	0
4. The students' ability to design and conduct experiments	5	4	3	2	1	0
5. The students' ability to analyze and interpret data	5	4	3	2	1	0
6. The students' ability to design a system, component, or process to meet a need	5	4	3	2	1	0
7. The students' ability to function on multi-disciplinary teams	5	4	3	2	1	0
8. The students' ability to identify, formulate, and solve engineering problems	5	4	3	2	1	0
9. The students' understanding of ethical and professional responsibility	5	4	3	2	1	0
10. The students' ability to communicate effectively in oral presentations	5	4	3	2	1	0
11. The students' ability to communicate effectively in writing	5	4	3	2	1	0
12. The students' broad education necessary to understand the impact of engineering solutions in a global and societal context	5	4	3	2	1	0

Appendix 13 Electrical and Computer Engineering Alumni Survey Sheet (rev. 4, 12/14/07)

DEPARTMENT OF ELECTRICAL AND COMPUTER ENGINEERING
CLEVELAND STATE UNIVERSITY

ALUMNI SURVEY

All individual responses will be kept confidential. Only results statistically compiled from the entire population will be shared.

Name _____ Email Address _____ Phone _____
Last First MI

Address (if different from that on the envelope)
Street Address _____ City _____ State _____ Zip _____

Employer Name _____ Position/Title _____

1. What is your year of graduation with a bachelor's degree?

_____

2. Does your current professional role at work *directly* involve Electrical or Computer Engineering?

☐ Yes ☐ No

3. What is your current position? *(Mark only one)*

☐ Within electrical or computer engineering ☐ Within another engineering field
☐ Outside engineering *(skip to question 5)* ☐ Unemployed *(skip to question 10)*

4. Which of the following topical areas do your professional responsibilities fall under? *(Mark all that apply)*

☐ Communications ☐ Power Electronics
☐ Computers ☐ Power Systems
☐ Controls ☐ Software
☐ Networks ☐ Other _____

5. What is the type of position you hold? *(Mark only one)*

☐ Consulting ☐ Customer Service/Support ☐ Research or Development ☐ Management
☐ Product Design ☐ Manufacturing/Production ☐ Marketing/Sales ☐ Testing
☐ Product Support ☐ Software Development ☐ Operations/Maintenance ☐ Other

6. How would you best characterize your current professional responsibilities? *(Mark all that apply)*

☐ Research-oriented; you lead a team of engineers in finding new problem areas to set direction for your company
☐ Assisting in research; you are part of a team of engineers that formulate new directions for your company
☐ Product development; you are involved in translating research ideas in your company into realizable products
☐ Technical support; you are involved in helping people diagnose problems with engineering systems and in solving such problems
☐ Documentation; you are involved in writing technical documentation intended to help your company's customers understand engineering systems
☐ Administrative; you are involved in administrative activities in your company

7. Do your professional responsibilities involve writing documentation that is intended for non-engineers?

☐ Yes ☐ No

8. Do your professional responsibilities involve meeting with or giving presentations to non-engineers?

☐ Yes ☐ No

9. How would you best characterize your mode of work?

☐ Minimal interaction with few people in the company
☐ Extensive interaction with several people in the company
☐ Extensive interaction with a variety of people, both within and outside the company

10. Since graduation, have you? ***(Mark all that apply)***

☐ Enrolled in graduate course(s)
☐ Participated in on-job training
☐ Joined a professional association
☐ Attended workshops or short courses
☐ Attended technical or professional conferences
☐ Regularly read technical or professional journals and magazines

How well did your undergraduate studies at Cleveland State University prepare you in the following areas?

	Very Well	Well	Moderately	Poorly	Very Poorly	N/A
11. Ability to apply knowledge of mathematics	☐	☐	☐	☐	☐	☐
12. Ability to apply knowledge of science	☐	☐	☐	☐	☐	☐
13. Ability to apply knowledge of engineering	☐	☐	☐	☐	☐	☐
14. Ability to design experiments	☐	☐	☐	☐	☐	☐
15. Ability to conduct experiments	☐	☐	☐	☐	☐	☐
16. Ability to analyze and interpret data	☐	☐	☐	☐	☐	☐
17. Ability to design a system, component, or process to meet a need	☐	☐	☐	☐	☐	☐
18. Ability to work in a multi-disciplinary team	☐	☐	☐	☐	☐	☐
19. Ability to identify, formulate, and solve engineering problems	☐	☐	☐	☐	☐	☐
20. Understanding of ethical and professional responsibility	☐	☐	☐	☐	☐	☐
21. Ability to communicate effectively in oral presentations	☐	☐	☐	☐	☐	☐
22. Ability to communicate effectively in writing	☐	☐	☐	☐	☐	☐
23. Understanding the impact of engineering solutions in a global/societal context	☐	☐	☐	☐	☐	☐
24. Knowledge of contemporary issues	☐	☐	☐	☐	☐	☐
25. Ability to use the up-to-date techniques necessary for engineering practice	☐	☐	☐	☐	☐	☐
26. Ability to use computers and modern software as problem-solving tools	☐	☐	☐	☐	☐	☐
27. Ability to use reference materials to solve problems	☐	☐	☐	☐	☐	☐
28. Knowledge of advanced topics in my discipline	☐	☐	☐	☐	☐	☐

29. Overall, the education that you received at Cleveland State was of:

☐ High quality ☐ Moderate quality ☐ Low quality

30. Please write any additional comments you may have about your educational experience at Cleveland State University (you may attach an additional sheet of paper).

Thank you for your participation in this survey. Your feedback is greatly appreciated!