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Program Objectives and Outcomes Assessment Plan for the Electrical Engineering Undergraduate Program

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1 Introduction

Under the ABET Engineering Criteria 2000 Guidelines each academic program seeking accreditation should establish and publish a detailed set of educational objectives consistent with the institutional mission, and a set of expected learning outcomes that students should be capable of attaining. The Guidelines also require that the program must establish an assessment plan that measures how the program is achieving its goals and use the information gathered to promote program improvement.

The department drafted and approved a Curricular Renewal and Assessment Plan that includes the definition of the program objectives and learning outcomes as well as the general process to be used for program improvement. The plan was approved on August 2001, together with the declarations of Program Educational Objectives and the Learning Outcomes.

The purpose of this document is to define the details of the assessment process that will be used to evaluate the program objectives and outcomes

2 Background Information

As of August 2001, the Electrical Engineering Undergraduate Program has the following objectives:

Table 1. BSEE Program Educational Objectives

Graduates from the EE program will:	
1	Obtain a broad educational experience necessary to understand the impact of electrical engineering problems and solutions within a global and societal context.
2	Possess a combination of knowledge and analytical, computational, and experimental skills necessary to solve practical electrical engineering problems.
3	Have adequate communications skills both as an individual and as part of a team.
4	Value the importance of lifelong learning.
5	Be aware of contemporary issues and thus be able to make decisions taking into consideration professional and societal needs, and ethical implications.

The statement of Program Learning Outcomes is included in Table 2:

Table 2. Program Educational Outcomes

After completing the program of study, graduates will have attained the following expected outcomes:	
a.	Ability to apply knowledge of mathematics, science, and engineering necessary to carry out analysis and design appropriate to electrical engineering problems.
b.	Ability to design and conduct experiments as well as analyze and interpret data.
c.	Ability to design a system to meet desired needs.
d.	Ability to function on multidisciplinary teams.
e.	Ability to identify, formulate, and solve engineering problems.
f.	Understanding of professional and ethical responsibility.
g.	Ability to communicate effectively.
h.	Broad education necessary to understand impact of engineering solutions in a global/societal context.
i.	Recognition of the need for and ability to engage in lifelong learning.
j.	Knowledge of contemporary issues.
k.	Ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.

The department also identified as the program constituency the population groups that directly benefit and must be satisfied by the program. These are:

- **The People of Puerto Rico** – The University of Puerto Rico was created by the Legislative Assembly to provide higher education opportunities for its citizens and to promote the social and economic development of the Island. Puerto Rican taxpayers provide more than 92 % of the UPR budget. We believe that this constituency is represented by the following sub constituents:
 - **Students** - students who are in their junior and senior years should primarily represent Students enrolled in our program. We believe that this constituency can provide feedback about how well is the internal curricular structure is helping them achieving their goals and aspirations.
 - **Alumni** – Former students who have completed their course of study during the previous two years. These stakeholders are most likely to be employed at entry level positions and are better prepared to judge if the program has adequately prepared them for their employment.
- **Employers of our students** – Employers’ satisfaction drives employment opportunities for our students. Supervisors of Coop students and graduate students can provide valuable insight on how well our alumni perform compared to their peer interns from other institutions.

3 Relationship between Program Objectives and Learning Outcomes

The relationship between the Program Objectives and the Learning Outcomes is described in Table 3. The Objectives and Outcomes are numbered using the same scheme described in the previous section. The table shows a close relationship between each one of the Program Objectives and the Outcomes. Each Objective covers several outcomes and each Outcome is covered by at least two objectives.

Table 3. Relationship between program Objectives and Learning Outcomes

Outcomes	Educational Objectives				
	1	2	3	4	5
<i>a</i>		X	X		
<i>b</i>		X	X	X	
<i>c</i>		X		X	
<i>d</i>			X	X	X
<i>e</i>		X	X	X	
<i>f</i>	X	X		X	X
<i>g</i>	X		X		X
<i>h</i>	X			X	X
<i>i</i>	X	X	X	X	X
<i>j</i>	X	X		X	X
<i>k</i>		X	X	X	X

3.1 Curricular Description

The existing curriculum was described in terms of the components used to achieve the objectives and help students achieve the expected outcomes. These components are described in Table 4. The purpose of this description is to simplify the analysis by grouping courses that share common objectives and goals.

Table 4. Components used in the Electrical Engineering Program

Strategy	What it includes
Language oral and written communications	Spanish and English language requirements.
Humanities and social sciences	Economics, Social Sciences, Humanities requirements.
Electives	Elective courses.
Mathematics	Calculus, differential equations, numerical methods, probability and statistics, and topics on linear algebra and complex variables
Physical sciences	Chemistry and Physics.
Fundamental knowledge of engineering sciences	Basic courses on engineering graphics, computer algorithms and languages, engineering materials, static and dynamic, thermodynamics, engineering probability.
Fundamental knowledge of EE	Basic courses on circuit and system analysis.
Core breadth of EE	Required courses in Electronics, Computer Architecture, Electromagnetism, Electrical Energy Conversion, Communications, Control Systems, and Laboratory experiences.
Option depth of EE	EE option track courses, which provides in depth coverage of at least one EE sub discipline.

The components described in the previous table are implemented by a group of carefully selected courses. The mapping of curricular components to actual courses is shown in Table 5.

Table 5. Mapping of curricular components into courses

Curricular Component		Courses		Credits
General education	Language oral and written communications	INGL 3101-02	Basic course in English I & II	6
		ESPA 3101-02	Basic course in Spanish I & II	6
		INGL 3201-02	Second year course in English II	6
	Humanities and social sciences	ECON 3021	Economics principles I	3
		----	Electives in Social Sciences and Humanities	15
		----		18
Electives	EDFI ----	Electives in Physical Education	2	
	----	Free elective	12	
				14
				50
Mathematics and physical sciences	Mathematics	MATE 3005	Pre-Calculus	5
		MATE 3031	Calculus I	4
		MATE 3032	Calculus II	4
		MATE 3063	Calculus III	3
		MATE 4009	Ordinary Differential Equations	3
	Physical sciences	MATE 4061	Numerical Analysis I	3
		ININ 4010	Probability and Statistics for Eng.	3
		QUIM 3001-02	General Chemistry with Lab I & II	8
		FISI 3171-73	Physics I and Lab	5
		FISI 3172-74	Physics II and Lab	5
				18
				43
Fundamental knowledge of engineering	Fundamental knowledge of engineering sciences	INGE 3011	Engineering Graphics I	2
		INGE 3016	Algorithms & Computer Programming	3
		INGE 3035	Engineering Mechanics	3
		INGE 3045	Materials Science for Elec.Eng.	3
		INME 4045	General Thermodynamics	3
	Fundamental knowledge of EE	ININ 4015	Engineering Economics	3
		INEL 3105	Electrical Systems Analysis I	3
		INEL 4102	Electrical Systems Analysis 2	3
		INEL 4103	Electrical Systems Analysis 3	3
		INEL 4115	Electrical Measurements Lab	1
				16
				33
Professional component	Core breadth of EE	INEL 4151-52	Electromagnetic Theory I & II	6
		INEL 4201-02	Electronics I & II	6
		INEL 4205	Logic Circuits	3
		INEL 4211-12	Electronics Laboratory I & II	2
		INEL 4206	Microprocessors I	3
		INEL 4405	Electric Machines	3
		INEL 4406	Electric Machines Laboratory	1
		INEL 4301	Communications Theory	3
		INEL 4505	Introduction to Control Systems	3
Option depth of EE	INEL ----	Technical Electives	18	
				18
				42
Total				168

Table 6 shows the estimated contribution of each of the program components to the achievement of the stated objectives.

Table 6. Relationship between curricular components and program objectives

Components	UPRM EE Objectives				
	1	2	3	4	5
Language oral and written communications	X		X		
Humanities and social sciences	X		X		X
Electives	X				
Mathematics		X	X		
Physical sciences		X	X		
Fundamental knowledge of engineering sciences		X	X		
Fundamental knowledge of EE		X	X		
Core breadth of EE		X	X	X	X
Option depth of EE		X	X	X	X

Table 7 shows the mapping between the program components and the expected outcomes. Those Components that are expected to contribute significantly to the achievement of the desired outcome have an “X” in the corresponding box.

Table 7. Relationship between program components and the program educational outcomes

Components	Outcomes										
	a	b	c	d	e	f	g	h	i	j	k
Language oral and written communications				X			X	X			
Humanities and social sciences				X		X	X	X	X	X	
Electives				X				X			X
Mathematics	X	X			X		X	X			
Physical sciences	X	X			X		X	X			
Fundamental knowledge of engineering sciences	X		X		X	X	X	X		X	X
Fundamental knowledge of EE	X	X	X		X	X				X	X
Core breadth of EE	X	X	X		X	X	X		X	X	X
Option depth of EE	X	X	X	X	X	X	X		X	X	X

4 Assessment Process Design

As a result of the design process, several assessment instruments were studied. In addition the experiences of other institutions were taken into consideration that helped put the expectations of the assessment process into the proper context. The choices of methods were narrowed down to five based on the following considerations:

- Each objective and outcome should be properly assessed by at least two instruments.
- The implementation should not put an excessive burden on the limited departmental resources.
- The methodology should be appropriate for a large size program.

The chosen instruments are shown in Table 8.

Table 8. Assessment instruments that were selected to evaluate the program

Assessment Instruments	Consists of:	Administration frequency
1 Transcripts analysis	Analysis of transcripts of graduation candidates to determine completion of program requirements.	At the end of the academic year (during the summer period)
2 Seniors survey	Survey administered to seniors enrolled in the capstone design course of the EE option.	Each academic term where senior design course is offered.
3 Alumni survey	Survey administered to alumni after 1 and 2 years of graduation.	Every two years during the month of February.
4 Recruiters survey	Survey administered to campus recruiters.	Every two years, as recruiters visit the campus
5 NCEES FE Examination	Report on the sub scores of the FE exam taken by our seniors.	Yearly, upon receipt of the report from the PR board.

4.1 Analysis of the success in achieving the program objectives

The preliminary study suggests that none of the instruments can adequately measure the program effectiveness in meeting all the objectives and outcomes. For each program objective, an analysis was done on what instruments were more appropriate to measure the success of the components used to achieve them. A match between the component and suitability of the assessment instrument was performed and, where the match was

found adequate, an assessment metric was defined. The results of this analysis are summarized in the following tables.

Table 9. Evaluation expectations for Program Objective 1

Components	Observation	Assessment Instruments	Assessment Metrics
Language oral and written communications	Obtain a broad educational experience necessary to understand the impact of electrical engineering problems and solutions within a global and societal context.	Transcripts analysis	Component GPA >3.0
		Seniors survey	Satisfaction > 80%
		Alumni survey	Satisfaction > 80%
Humanities and social sciences	Obtain a broad educational experience necessary to understand the impact of electrical engineering problems and solutions within a global and societal context.	Transcripts analysis	Component GPA >3.0
		Seniors survey	Satisfaction > 80%
		Alumni survey	Satisfaction > 80%
Electives	Graduates will be able to diversify their education into other fields of their personal interest.	Seniors survey	Satisfaction > 80%
		Alumni survey	Satisfaction > 80%

Table 10. Evaluation expectations for Program Objective 2

Components	Observation	Assessment Instruments	Assessment Metrics
Mathematics	Thorough knowledge of math, science, and engineering fundamentals.	Transcripts analysis	Component GPA >3.0
		Seniors survey	Satisfaction > 80%
		Alumni survey	Satisfaction > 80%
		Recruiters survey	Satisfaction > 80%
		NCEES FE Examination	EE seniors average > US
Physical sciences	Thorough knowledge of math, science, and engineering fundamentals. Physical thinking, approximation and simplification.	Transcripts analysis	Component GPA >3.0
		Seniors survey	Satisfaction > 80%
		Alumni survey	Satisfaction > 80%
		Recruiters survey	Satisfaction > 80%
		NCEES FE Examination	EE seniors' Chemistry average > US
Fundamental knowledge of engineering sciences	Thorough knowledge of math, science, and engineering fundamentals. Physical thinking, approximation and simplification.	Transcripts analysis	Component GPA >3.0.
		Seniors survey	Satisfaction > 80%
		Alumni survey	Satisfaction > 80%
		Recruiters survey	Satisfaction > 80%
		NCEES FE Examination	EE seniors average > US in most subjects.
Fundamental knowledge of EE	Thorough knowledge of basic electrical and computer engineering fundamentals and concepts. Physical thinking, approximation and simplification.	Transcripts analysis	Component GPA >3.0
		Seniors survey	Satisfaction > 80%
		Alumni survey	Satisfaction > 80%
		Recruiters survey	Satisfaction > 80%
		NCEES FE Examination	Seniors passing rate > US
Core breadth of EE	Basic engineering design skills and in-depth knowledge of at least one EE area: (electronics, control, communications, and power systems). Physical thinking, approximation and simplification.	Transcripts analysis	Component GPA >3.0
		Seniors survey	Satisfaction > 80%
		Alumni survey	Satisfaction > 80%
		Recruiters survey	Satisfaction > 80%
		NCEES FE Examination	Seniors passing rate > US
Option depth of EE	Basic engineering design skills and in-depth knowledge of at least one EE area: (electronics, control, communications, and power systems). Ability to integrate knowledge and skills across discipline boundaries.	Transcripts analysis	Component GPA >3.0
		Seniors survey	Satisfaction > 80%
		Alumni survey	Satisfaction > 80%
		Recruiters survey	Satisfaction > 80%

Table 11. Evaluation expectations for Program Objective 3

Components	Observation	Assessment Instruments	Assessment Metrics
Language oral and written communications	Develop ability to communicate effectively verbally and in writing in English and Spanish.	Transcripts analysis	Component GPA >3.0
		Seniors survey	Satisfaction > 80%
		Alumni survey	Satisfaction > 80%
		Recruiters survey	Satisfaction > 80%
Humanities and social sciences	Develop ability to organize information; work in groups and to interact with the social environment.	Transcripts analysis	Component GPA >3.0.
		Seniors survey	Satisfaction > 80%
		Alumni survey	Satisfaction > 80%
		Recruiters survey	Satisfaction > 80%
Mathematics	Develop ability to interpret graphical, numerical, and textual data; communicate technical information in oral, written and graphical forms, in English and Spanish.	Transcripts analysis	Component GPA >3.0
		Seniors survey	Satisfaction > 80%
		Alumni survey	Satisfaction > 80%
		Recruiters survey	Satisfaction > 80%
		NCEES FE Examination	EE seniors average > US
Physical sciences	Develop ability to interpret graphical, numerical, and textual data; communicate technical information in oral, written and graphical forms, in English and Spanish; organize information.	Transcripts analysis	Component GPA >3.0
		Seniors survey	Satisfaction > 80%
		Alumni survey	Satisfaction > 80%
Fundamental knowledge of engineering sciences	Develop ability to interpret graphical, numerical, and textual data; communicate technical information in oral, written, and graphical forms, in English and Spanish; organize information.	Transcripts analysis	Component GPA >3.0
		Seniors survey	Satisfaction > 80%
		Alumni survey	Satisfaction > 80%
		Recruiters survey	Satisfaction > 80%
		NCEES FE Examination	EE seniors average > US in most subjects.
Fundamental knowledge of EE	Develop ability to interpret graphical, numerical, and textual data; communicate technical information to in oral, written, and graphical forms, in English and Spanish; organize information.	Transcripts analysis	Component GPA >3.0
		Seniors survey	Satisfaction > 80%
		Alumni survey	Satisfaction > 80%
		Recruiters survey	Satisfaction > 80%
		NCEES FE Examination	Seniors passing rate > US
Core breadth of EE	Develop ability to interpret graphical, numerical, and textual data; communicate technical information in oral, written, and graphical forms, in English and Spanish; organize information.	Transcripts analysis	Component GPA >3.0
		Seniors survey	Satisfaction > 80%
		Alumni survey	Satisfaction > 80%
		Recruiters survey	Satisfaction > 80%
		NCEES FE Examination	Seniors passing rate > US
Option Depth of EE	Develop ability to interpret graphical, numerical, and textual data; communicate technical information in English and Spanish; organize information; work in groups and to interact with the social environment; and lead effectively.	Transcripts analysis	Component GPA >3.0
		Seniors survey	Satisfaction > 80%
		Alumni survey	Satisfaction > 80%
		Recruiters survey	Satisfaction > 80%

Table 12. Evaluation expectations for Program Objective 4

Components	Observation	Assessment Instruments	Assessment Metrics
Core breadth of EE	Knowing how to ask questions and that there may be multiple answers. Commitment to constantly upgrading fundamental knowledge and skills. Understanding that every situation is an opportunity for learning.	Transcripts analysis	Component GPA >3.0
		Seniors survey	Satisfaction > 80%
		Alumni survey	Satisfaction > 80%
Option depth of EE	Knowing how to ask questions and that there may be multiple answers. Commitment to constantly upgrading fundamental knowledge and skills. Understanding that every situation is an opportunity for learning.	Transcripts analysis	Component GPA >3.0
		Seniors survey	Satisfaction > 80%
		Alumni survey	Satisfaction > 80%

Table 13. Evaluation expectations for Program Objective 5

Components	Observation	Assessment Instruments	Assessment Metrics
Humanities and social sciences	Develop ability to distinguish between ideas, opinions, beliefs, and facts; understand one's own cultural traditions in a broader context; consciousness of the ethical and societal aspects of their profession.	Transcripts analysis	Component GPA >3.0
		Seniors survey	Satisfaction > 80%
		Alumni survey	Satisfaction > 80%
		Recruiters survey	Satisfaction > 80%
		NCEES FE Examination	EE seniors score for Ethics > US
Core breadth of EE	Develop ability to distinguish between ideas, opinions, beliefs, and facts; consciousness of the ethical and societal aspects of their profession.	Transcripts analysis	Component GPA >3.0
		Seniors survey	Satisfaction > 80%
		Alumni survey	Satisfaction > 80%
		Recruiters survey	Satisfaction > 80%
		NCEES FE Examination	EE seniors score for Ethics > US
Option depth of EE	Develop ability to distinguish between ideas, opinions, beliefs, and facts; consciousness of the ethical and societal aspects of their profession.	Transcripts analysis	Component GPA >3.0
		Seniors survey	Satisfaction > 80%
		Alumni survey	Satisfaction > 80%
		Recruiters survey	Satisfaction > 80%
		NCEES FE Examination	EE seniors score for Ethics > US
Professional associations	Through their activities, professional associations provide their members with a broad view of the impact of external issues on engineering problems.	Seniors survey	IEEE membership > 50%.
		Alumni survey	IEEE membership > 50%.
Participation in other extracurricular activities	Participation in non-professional associations help in understanding society needs and expectations.	Seniors survey	Participation >25 %.
		Alumni survey	Participation >25 %.

Since no reference data is available, the initial metrics were selected as an 80% satisfaction with the issue and a 3.0 average for a group of courses. The completion of the first assessment cycle will provide some insight of the reasonableness of these expectations and will help in determining the baseline for future assessment cycles.

4.2 Analysis of the success in of the program in helping the students achieve the program expected learning outcomes

If the program is successful, the average graduate should satisfactorily demonstrate the achievement of the expected learning outcomes described earlier. Since the relationship between the program objectives and learning outcomes was already established in Table 3, it is possible to describe the program effectiveness by reorganizing the assessment matrix in terms of the expected outcomes.

The adequacy of the assessment instruments to the measurement of the expected outcomes is presented in Table 14. It can be seen from the table that the instrument

coverage is dense, indicating the possibility of reducing the number of instruments in future cycles.

Table 14. Relationship between the assessment instruments and the expected outcomes

Assessment Instrument	Outcomes										
	a	b	c	d	e	f	g	h	i	j	k
Transcripts analysis	X	X			X		X	X			X
Seniors survey	X	X	X	X	X	X	X	X	X	X	X
Alumni survey	X	X	X	X	X	X	X	X	X	X	X
Recruiter survey	X	X	X	X	X	X	X	X	X	X	X
NCEES FE Examination	X	X	X		X	X					X

The results of expressing the assessment matrix in terms of the expected outcomes are presented in Tables 15 to 25. The tables are organized with the same structure used for the assessment of the objectives.

Table 15. Assessment expectations for Outcome (a)

Outcome (a)			
Component	Observation	Assessment Methods	Assessment Metric
Mathematics	Able to apply math, science, and engineering knowledge to electrical engineering problems.	Transcripts analysis	Component GPA >3.0
		Seniors survey	Satisfaction > 80%
		Alumni survey	Satisfaction > 80%
		Recruiter survey	Satisfaction > 80%
		NCEES FE Examination	Seniors score > US average
	Able to apply probability and statistical methods in practical engineering problems where such approach is appropriate.	Transcripts analysis	Course GPA >3.00
		Seniors survey	Satisfaction > 80%
		Alumni survey	Satisfaction > 80%
		Recruiter survey	Satisfaction > 80%
	Able to apply linear algebra concepts to the description and solution of EE engineering problems.	Seniors survey	Satisfaction > 80%
		Alumni survey	Satisfaction > 80%
		Recruiter survey	Satisfaction > 80%
	Able to apply complex variable concepts to the description and solution of EE engineering problems.	Seniors survey	Satisfaction > 80%
		Alumni survey	Satisfaction > 80%
Recruiter survey		Satisfaction > 80%	
Able to apply discrete mathematics concepts to the description and solution of EE engineering problems.	Seniors survey	Satisfaction > 80%	
	Alumni survey	Satisfaction > 80%	
	Recruiter survey	Satisfaction > 80%	
Physical sciences	Possess sufficient knowledge of the basic physical and engineering sciences that will enable them to understand the physical operation of electrical and electronic devices and systems.	Transcripts analysis	Component GPA >3.00
		Seniors survey	Satisfaction > 80%
		Alumni survey	Satisfaction > 80%
		Recruiter survey	Satisfaction > 80%
		NCEES FE Examination	EE seniors average Chemistry score > US.
Fundamental knowledge of engineering sciences	Possess sufficient knowledge of the basic physical and engineering sciences that will enable them to understand the physical operation of electrical and electronic devices and systems.	Transcripts analysis	Component GPA >3.0
		Seniors survey	Satisfaction > 80%
		Alumni survey	Satisfaction > 80%
		Recruiter survey	Satisfaction > 80%
		NCEES FE Examination	Seniors score > US average
Fundamental knowledge of EE	Possess sufficient knowledge of the basic physical and engineering sciences that will enable them to understand the physical operation of electrical and electronic devices and systems.	Transcripts analysis	Component GPA >3.0
		Seniors survey	Satisfaction > 80%
		Alumni survey	Satisfaction > 80%
		Recruiter survey	Satisfaction > 80%
		NCEES FE Examination	EE seniors passing rate > US
Core breadth of EE	Possess sufficient knowledge of the basic physical and engineering sciences that will enable them to understand the physical operation of electrical and electronic devices and systems.	Transcripts analysis	Component GPA >3.0
		Seniors survey	Satisfaction > 80%
		Alumni survey	Satisfaction > 80%
		Recruiter survey	Satisfaction > 80%
		NCEES FE Examination	EE seniors passing rate > US

Outcome (a)			
Component	Observation	Assessment Methods	Assessment Metric
Option depth of EE	Possess sufficient knowledge of the basic physical and engineering sciences that will enable them to understand the physical operation of electrical and electronic devices and systems.	Transcripts analysis	Component GPA >3.0
		Seniors survey	Satisfaction > 80%
		Alumni survey	Satisfaction > 80%
		Recruiter survey	Satisfaction > 80%

Table 16. Assessment expectations for Outcome (b)

Program Component	Observation	Assessment Instruments	Assessment Metrics
Mathematics	Able to graphically and verbally represent or describe experimental data sets.	Transcripts analysis	Component GPA >3.0
		Seniors survey	Satisfaction > 80%
		Alumni survey	Satisfaction > 80%
		Recruiter survey	Satisfaction > 80%
		NCEES FE Examination	Seniors score > US
Physical sciences	Able to graphically and verbally represent or describe experimental data sets.	Transcripts analysis	Component GPA >3.0
		Seniors survey	Satisfaction > 80%
		Alumni survey	Satisfaction > 80%
		Recruiter survey	Satisfaction > 80%
		NCEES FE Examination	EE seniors Chemistry score > US.
Fundamental knowledge of EE	Able to solve an experimental electrical engineering problem.	Transcripts analysis	Component GPA >3.0
		Seniors survey	Satisfaction > 80%
		Alumni survey	Satisfaction > 80%
		Recruiter survey	Satisfaction > 80%
Core breadth of EE	Able to solve an experimental electrical Engineering problem.	Transcripts analysis	Component GPA >3.0
		Seniors survey	Satisfaction > 80%
		Alumni survey	Satisfaction > 80%
		Recruiter survey	Satisfaction > 80%
	Able to set up and safely perform engineering laboratory test procedures.	Transcripts analysis	Component GPA >3.0
		Seniors survey	Satisfaction > 80%
		Alumni survey	Satisfaction > 80%
		Recruiter survey	Satisfaction > 80%
	Able to graphically and verbally represent or describe experimental data sets.	Transcripts analysis	Component GPA >3.0
		Seniors survey	Satisfaction > 80%
		Alumni survey	Satisfaction > 80%
		Recruiter survey	Satisfaction > 80%
	Able to analyze, interpret, and draw conclusions based on experimental data.	NCEES FE Examination	Seniors passing rate > US
		Transcripts analysis	Component GPA >3.0
		Seniors survey	Satisfaction > 80%
		Alumni survey	Satisfaction > 80%
	Able to design experiments and prototypes to test design concepts.	Recruiter survey	Satisfaction > 80%
		Transcripts analysis	Component GPA >3.0
		Seniors survey	Satisfaction > 80%
		Alumni survey	Satisfaction > 80%
Option depth of EE	Able to design experiments and prototypes to test design concepts.	Recruiter survey	Satisfaction > 80%
		Transcripts analysis	Component GPA >3.0
		Seniors survey	Satisfaction > 80%
		Alumni survey	Satisfaction > 80%

Table 17. Assessment expectations for Outcome (c)

Program Component	Observation	Assessment Instruments	Assessment Metrics	Actual Results
Core breadth of EE	Competent in determining design specifications and the scope of the project.	Seniors survey	Satisfaction > 80%	86%
		Alumni survey	Satisfaction > 80%	86%
		Recruiter survey	Satisfaction > 80%	76%
		NCEES FE Examination	Seniors passing rate > US	Yes, +10%
	Able to determine the standard or criteria against which the outcome of the design process will be measured or compared.	Seniors survey	Satisfaction > 80%	82%
		Alumni survey	Satisfaction > 80%	84%
		Recruiter survey	Satisfaction > 80%	74%
		NCEES FE Examination	Seniors passing rate > US	Yes, +10%
	Competent in documenting design procedures.	Seniors survey	Satisfaction > 80%	82%
		Alumni survey	Satisfaction > 80%	82%
		Recruiter survey	Satisfaction > 80%	78%
		NCEES FE Examination	Seniors passing rate > US	Yes, +10%
	Able to follow logical and orderly design procedures, choosing the best solution for a given set of criteria.	Seniors survey	Satisfaction > 80%	86%
		Alumni survey	Satisfaction > 80%	86%
		Recruiter survey	Satisfaction > 80%	80%
		NCEES FE Examination	Seniors passing rate > US	Yes, +10%
Option depth of EE	Competent in determining design specifications and the scope of the project.	Seniors survey	Satisfaction > 80%	86%
		Alumni survey	Satisfaction > 80%	86%
		Recruiter survey	Satisfaction > 80%	76%
		NCEES FE Examination	Seniors passing rate > US	Yes, +10%
	Able to determine the standard or criteria against which the outcome of the design process will be measured or compared.	Seniors survey	Satisfaction > 80%	82%
		Alumni survey	Satisfaction > 80%	82%
		Recruiter survey	Satisfaction > 80%	74%
		NCEES FE Examination	Seniors passing rate > US	Yes, +10%
	Competent in documenting design procedures.	Seniors survey	Satisfaction > 80%	84%
		Alumni survey	Satisfaction > 80%	84%
		Recruiter survey	Satisfaction > 80%	78%
		NCEES FE Examination	Seniors passing rate > US	Yes, +10%
	Able to follow logical and orderly design procedures, choosing the best solution for a given set of criteria.	Seniors survey	Satisfaction > 80%	86%
		Alumni survey	Satisfaction > 80%	86%
		Recruiter survey	Satisfaction > 80%	80%
		NCEES FE Examination	Seniors passing rate > US	Yes, +10%

Table 18. Assessment expectations for Outcome (d)

Program Component	Observation	Assessment Instruments	Assessment Metrics
Language oral and written communications	Able to communicate effectively with other team members.	Seniors survey	Satisfaction > 80%
		Alumni survey	Satisfaction > 80%
		Recruiter survey	Satisfaction > 80%
Humanities and social sciences	Understand the basic terminology used in other disciplines.	Seniors survey	Satisfaction > 80%
		Alumni survey	Satisfaction > 80%
		Recruiter survey	Satisfaction > 80%
Mathematics	Understand the basic terminology used in other disciplines.	Seniors survey	Satisfaction > 80%
		Alumni survey	Satisfaction > 80%
		Recruiter survey	Satisfaction > 80%
Physical sciences	Understand the basic terminology used in other disciplines.	Seniors survey	Satisfaction > 80%
		Alumni survey	Satisfaction > 80%
		Recruiter survey	Satisfaction > 80%
Fundamental knowledge of engineering sciences	Understand the basic terminology used in other disciplines.	Seniors survey	Satisfaction > 80%
		Alumni survey	Satisfaction > 80%
		Recruiter survey	Satisfaction > 80%
Core breadth of EE	Able to articulate teamwork principles (group dynamics).	Seniors survey	Satisfaction > 80%
		Alumni survey	Satisfaction > 80%
		Recruiter survey	Satisfaction > 80%
	Comfortable breaking up a complex problem into separate tasks, delegating tasks to other team members, and integrating the composite effort of the group into a final solution.	Seniors survey	Satisfaction > 80%
		Alumni survey	Satisfaction > 80%
		Recruiter survey	Satisfaction > 80%
	Graduates will be able to integrate knowledge and skills across discipline boundaries.	Seniors survey	Satisfaction > 80%
		Alumni survey	Satisfaction > 80%
		Recruiter survey	Satisfaction > 80%
	Able to communicate effectively with other team members.	Seniors survey	Satisfaction > 80%
		Seniors survey	Satisfaction > 80%
		Alumni survey	Satisfaction > 80%
Option depth of EE	Able to articulate teamwork principles (group dynamics).	Seniors survey	Satisfaction > 80%
		Alumni survey	Satisfaction > 80%
		Recruiter survey	Satisfaction > 80%
	Comfortable breaking up a complex problem into separate tasks, delegating tasks to other team members, and integrating the composite effort of the group into a final solution.	Seniors survey	Satisfaction > 80%
		Alumni survey	Satisfaction > 80%
		Recruiter survey	Satisfaction > 80%
	Graduates will be able to integrate knowledge and skills across discipline boundaries.	Seniors survey	Satisfaction > 80%
		Alumni survey	Satisfaction > 80%
		Recruiter survey	Satisfaction > 80%
	Able to communicate effectively with other team members.	Seniors survey	Satisfaction > 80%
		Alumni survey	Satisfaction > 80%
		Recruiter survey	Satisfaction > 80%

Table 19. Assessment expectations for Outcome (e)

Outcome (e)			
Program Component	Observation	Assessment Instruments	Assessment Metrics
Mathematics	Capable of recognizing and understanding problem specifications, physical, and ethical constraints.	Transcripts analysis	Component GPA >3.0
		Seniors survey	Satisfaction > 80%
		Alumni survey	Satisfaction > 80%
		Recruiter survey	Satisfaction > 80%
		NCEES FE Examination	Seniors score > US
Physical sciences	Capable of recognizing and understanding problem specifications, physical, and ethical constraints.	Transcripts analysis	Component GPA >3.0
		Seniors survey	Satisfaction > 80%
		Alumni survey	Satisfaction > 80%
		Recruiter survey	Satisfaction > 80%
		NCEES FE Examination	EE seniors Chemistry score > US.
Fundamental knowledge of engineering sciences	Capable of recognizing that they are facing an engineering problem.	Transcripts analysis	Component GPA >3.0
		Seniors survey	Satisfaction > 80%
		Alumni survey	Satisfaction > 80%
		Recruiter survey	Satisfaction > 80%
		NCEES FE Examination	Seniors score > US in most subjects
	Capable of recognizing and understanding problem specifications, physical, and ethical constraints.	Transcripts analysis	Component GPA >3.0
		Seniors survey	Satisfaction > 80%
		Alumni survey	Satisfaction > 80%
		Recruiter survey	Satisfaction > 80%
		NCEES FE Examination	Seniors score > US
Fundamental knowledge of EE	Capable of recognizing and understanding problem specifications, physical, and ethical constraints.	Transcripts analysis	Component GPA >3.0
		Seniors survey	Satisfaction > 80%
		Alumni survey	Satisfaction > 80%
		Recruiter survey	Satisfaction > 80%
		NCEES FE Examination	Seniors passing rate > US
	Capable of physical thinking, approximation and simplification.	Transcripts analysis	Component GPA >3.0
		Seniors survey	Satisfaction > 80%
		Alumni survey	Satisfaction > 80%
		Recruiter survey	Satisfaction > 80%
		NCEES FE Examination	Seniors passing rate > US
	Capable of effectively describe a problem in a way that can lead to the construction of the solution.	Transcripts analysis	Component GPA >3.0
		Seniors survey	Satisfaction > 80%
		Alumni survey	Satisfaction > 80%
		Recruiter survey	Satisfaction > 80%
		NCEES FE Examination	Seniors passing rate > US
	Capable of defining a possible solution.	Transcripts analysis	Component GPA >3.0
		Seniors survey	Satisfaction > 80%
		Alumni survey	Satisfaction > 80%
		Recruiter survey	Satisfaction > 80%
		NCEES FE Examination	Seniors passing rate > US
Able to determine the reasonableness of a solution within the physical and ethical context of the problem.	Transcripts analysis	Component GPA >3.0	
	Seniors survey	Satisfaction > 80%	
	Alumni survey	Satisfaction > 80%	
	Recruiter survey	Satisfaction > 80%	
	NCEES FE Examination	Seniors passing rate > US	

Outcome (e)			
Program Component	Observation	Assessment Instruments	Assessment Metrics
Core breadth of EE	Capable of recognizing that they are facing an engineering problem.	Transcripts analysis	Component GPA >3.0
		Seniors survey	Satisfaction > 80%
		Alumni survey	Satisfaction > 80%
		Recruiter survey	Satisfaction > 80%
		NCEES FE Examination	Seniors passing rate > US
	Capable of recognizing and understanding problem specifications, physical, and ethical constraints.	Transcripts analysis	Component GPA >3.0
		Seniors survey	Satisfaction > 80%
		Alumni survey	Satisfaction > 80%
		Recruiter survey	Satisfaction > 80%
		NCEES FE Examination	Seniors passing rate > US
	Capable of physical thinking, approximation and simplification.	Transcripts analysis	Component GPA >3.0
		Seniors survey	Satisfaction > 80%
		Alumni survey	Satisfaction > 80%
		Recruiter survey	Satisfaction > 80%
		NCEES FE Examination	Seniors passing rate > US
	Capable of effectively describe a problem in a way that can lead to the construction of the solution.	Transcripts analysis	Component GPA >3.0
		Seniors survey	Satisfaction > 80%
		Alumni survey	Satisfaction > 80%
		Recruiter survey	Satisfaction > 80%
		NCEES FE Examination	Seniors passing rate > US
Capable of defining a possible solution.	Transcripts analysis	Component GPA >3.0	
	Seniors survey	Satisfaction > 80%	
	Alumni survey	Satisfaction > 80%	
	Recruiter survey	Satisfaction > 80%	
	NCEES FE Examination	Seniors passing rate > US	
Able to determine the reasonableness of a solution within the physical and ethical context of the problem.	Transcripts analysis	Component GPA >3.0	
	Seniors survey	Satisfaction > 80%	
	Alumni survey	Satisfaction > 80%	
	Recruiter survey	Satisfaction > 80%	
	NCEES FE Examination	Seniors passing rate > US	
Option depth of EE	Capable of recognizing that they are facing an engineering problem.	Transcripts analysis	Component GPA >3.0
		Seniors survey	Satisfaction > 80%
		Alumni survey	Satisfaction > 80%
		Recruiter survey	Satisfaction > 80%
		Transcripts analysis	Component GPA >3.0
	Capable of recognizing and understanding problem specifications, physical, and ethical constraints.	Seniors survey	Satisfaction > 80%
		Alumni survey	Satisfaction > 80%
		Recruiter survey	Satisfaction > 80%
		Transcripts analysis	Component GPA >3.0
		Seniors survey	Satisfaction > 80%
	Capable of physical thinking, approximation and simplification.	Alumni survey	Satisfaction > 80%
		Recruiter survey	Satisfaction > 80%
		Transcripts analysis	Component GPA >3.0
		Seniors survey	Satisfaction > 80%
		Alumni survey	Satisfaction > 80%
	Capable of effectively describe a problem in a way that can lead to the construction of the solution.	Recruiter survey	Satisfaction > 80%
		Transcripts analysis	Component GPA >3.0
		Seniors survey	Satisfaction > 80%
		Alumni survey	Satisfaction > 80%
		Recruiter survey	Satisfaction > 80%
Capable of defining a possible solution.	Transcripts analysis	Component GPA >3.0	
	Seniors survey	Satisfaction > 80%	
	Alumni survey	Satisfaction > 80%	
	Recruiter survey	Satisfaction > 80%	
	Transcripts analysis	Component GPA >3.0	
Able to determine the reasonableness of a solution within the physical and ethical context of the problem.	Seniors survey	Satisfaction > 80%	
	Alumni survey	Satisfaction > 80%	
	Recruiter survey	Satisfaction > 80%	
	Transcripts analysis	Component GPA >3.0	
	Seniors survey	Satisfaction > 80%	

Table 20. Assessment expectations for Outcome (f)

Program Component	Observation	Assessment Instruments	Assessment Metrics
Humanities and social sciences	Able to identify the ethical issues faced on the solution of an engineering problem.	Seniors survey	Satisfaction > 80%
		Alumni survey	Satisfaction > 80%
		Recruiter survey	Satisfaction > 80%
		NCEES FE Examination	Seniors Ethics score > US
Fundamental knowledge of engineering sciences	Able to identify the ethical issues faced on the solution of an engineering problem.	Seniors survey	Satisfaction > 80%
		Alumni survey	Satisfaction > 80%
		Recruiter survey	Satisfaction > 80%
		NCEES FE Examination	Seniors Ethics score > US
Fundamental knowledge of EE	Able to identify the ethical issues faced on the solution of an engineering problem.	Seniors survey	Satisfaction > 80%
		Alumni survey	Satisfaction > 80%
		Recruiter survey	Satisfaction > 80%
		NCEES FE Examination	Seniors Ethics score > US
Core breadth of EE	Able to identify the ethical issues faced on the solution of an engineering problem.	Seniors survey	Satisfaction > 80%
		Alumni survey	Satisfaction > 80%
		Recruiter survey	Satisfaction > 80%
		NCEES FE Examination	Seniors Ethics score > US
Option depth of EE	Understand the proper use of the work of others and issues such as plagiarism, copyrights, and patents.	Seniors survey	Satisfaction > 80%
		Alumni survey	Satisfaction > 80%
		Recruiter survey	Satisfaction > 80%
		NCEES FE Examination	Seniors Ethics score > US
	Able to identify the ethical issues faced on the solution of an engineering problem.	Seniors survey	Satisfaction > 80%
		Alumni survey	Satisfaction > 80%
		Recruiter survey	Satisfaction > 80%
		NCEES FE Examination	Seniors Ethics score > US
	Aware and can interpret the IEEE Code of Ethics.	Seniors survey	Satisfaction > 80%
		Alumni survey	Satisfaction > 80%
		Recruiter survey	Satisfaction > 80%
		NCEES FE Examination	Seniors Ethics score > US
Professional associations	Aware and can interpret the IEEE Code of Ethics.	Seniors survey	IEEE membership > 50 %.
		Alumni survey	IEEE membership > 50 %.
Participation in other extracurricular activities	Able to identify the ethical issues faced on the solution of an engineering problem.	Seniors survey	Participation >25 %.
		Alumni survey	Participation >25 %.

Table 21. Assessment expectations for Outcome (g)

Program Component	Observation	Assessment Instruments	Assessment Metrics
Language oral and written communications	Able to write effectively and be understood by technical and non-technical audiences.	Transcripts analysis	Component GPA >3.0
		Seniors survey	Satisfaction > 80%
		Alumni survey	Satisfaction > 80%
		Recruiter survey	Satisfaction > 80%
	Able to summarize their own work and the work of others.	Transcripts analysis	Component GPA >3.0
		Seniors survey	Satisfaction > 80%
		Alumni survey	Satisfaction > 80%
		Recruiter survey	Satisfaction > 80%
Humanities and social sciences	Able to summarize their own work and the work of others.	Transcripts analysis	Component GPA >3.0
		Seniors survey	Satisfaction > 80%
		Alumni survey	Satisfaction > 80%
		Recruiter survey	Satisfaction > 80%
Mathematics	Able to communicate graphically where appropriate.	Transcripts analysis	Component GPA >3.0
		Seniors survey	Satisfaction > 80%
		Alumni survey	Satisfaction > 80%
		Recruiter survey	Satisfaction > 80%
Physical sciences	Able to communicate graphically where appropriate.	Transcripts analysis	Component GPA >3.0
		Seniors survey	Satisfaction > 80%
		Alumni survey	Satisfaction > 80%
		Recruiter survey	Satisfaction > 80%
Fundamental knowledge of engineering sciences	Able to communicate graphically where appropriate.	Transcripts analysis	Component GPA >3.0
		Seniors survey	Satisfaction > 80%
		Alumni survey	Satisfaction > 80%
		Recruiter survey	Satisfaction > 80%
Fundamental knowledge of EE	Able to communicate graphically where appropriate.	Transcripts analysis	Component GPA >3.0
		Seniors survey	Satisfaction > 80%
		Alumni survey	Satisfaction > 80%
		Recruiter survey	Satisfaction > 80%
Core breadth of EE	Able to summarize their own work and the work of others.	Transcripts analysis	Component GPA >3.0
		Seniors survey	Satisfaction > 80%
		Alumni survey	Satisfaction > 80%
		Recruiter survey	Satisfaction > 80%
	Able to communicate graphically where appropriate.	Transcripts analysis	Component GPA >3.0
		Seniors survey	Satisfaction > 80%
		Alumni survey	Satisfaction > 80%
		Recruiter survey	Satisfaction > 80%
Option depth of EE	Able to write effectively and be understood by technical and non-technical audiences.	Transcripts analysis	Component GPA >3.0
		Seniors survey	Satisfaction > 80%
		Alumni survey	Satisfaction > 80%
		Recruiter survey	Satisfaction > 80%
	Able to perform effective oral presentations and be understood by technical and non-technical audiences.	Transcripts analysis	Component GPA >3.0
		Seniors survey	Satisfaction > 80%
		Alumni survey	Satisfaction > 80%
		Recruiter survey	Satisfaction > 80%
	Able to summarize their own work and the work of others.	Transcripts analysis	Component GPA >3.0
		Seniors survey	Satisfaction > 80%
		Alumni survey	Satisfaction > 80%
		Recruiter survey	Satisfaction > 80%
	Able to communicate graphically where appropriate.	Transcripts analysis	Component GPA >3.0
		Seniors survey	Satisfaction > 80%
		Alumni survey	Satisfaction > 80%
		Recruiter survey	Satisfaction > 80%

Table 22. Assessment expectations for Outcome (h)

Program Component	Observation	Assessment Instruments	Assessment Metrics
Humanities and social sciences	Understand the impact of engineering solutions in a global and societal context.	Transcripts analysis	Component GPA >3.0
		Seniors survey	Satisfaction > 80%
		Alumni survey	Satisfaction > 80%
		Recruiter survey	Satisfaction > 80%
Electives	Understand the impact of engineering solutions in a global and societal context.	Seniors survey	Satisfaction > 80%
		Alumni survey	Satisfaction > 80%
Physical sciences	Aware of the long term implications of engineering solutions on the quality of life and the environment.	Transcripts analysis	Component GPA >3.0
		Seniors survey	Satisfaction > 80%
		Alumni survey	Satisfaction > 80%
		Recruiter survey	Satisfaction > 80%
Fundamental knowledge of engineering sciences	Aware of the long term implications of engineering solutions on the quality of life and the environment.	Transcripts analysis	Component GPA >3.0
		Seniors survey	Satisfaction > 80%
		Alumni survey	Satisfaction > 80%
		Recruiter survey	Satisfaction > 80%

Table 23. Assessment expectations for Outcome (i)

Program Component	Observation	Assessment Instruments	Assessment Metrics
Electives	Capable of independent learning and in the search for information.	Seniors survey	Satisfaction > 80%
		Alumni survey	Satisfaction > 80%
		Recruiter survey	Satisfaction > 80%
Core breadth of EE	Capable of using information searching tools and resources necessary to be up to date in their discipline.	Seniors survey	Satisfaction > 80%
		Alumni survey	Satisfaction > 80%
		Recruiter survey	Satisfaction > 80%
Option depth of EE	Capable of using information searching tools and resources necessary to be up to date in their discipline.	Seniors survey	Satisfaction > 80%
		Alumni survey	Satisfaction > 80%
		Recruiter survey	Satisfaction > 80%
Professional associations	Understand the importance of professional societies in their professional development.	Seniors survey	IEEE membership > 50%.
		Alumni survey	IEEE membership > 50%.

Table 24. Assessment expectations for Outcome (j)

Program Component	Observation	Assessment Instruments	Assessment Metrics
Humanities and social sciences	Aware of current professional and societal issues.	Transcripts analysis	Component GPA > 3.0
		Seniors survey	Satisfaction > 80%
		Alumni survey	Satisfaction > 80%
		Recruiter survey	Satisfaction > 80%
	Able to differentiate between facts, beliefs, and opinions.	Transcripts analysis	Component GPA > 3.0
		Seniors survey	Satisfaction > 80%
		Alumni survey	Satisfaction > 80%
		Recruiter survey	Satisfaction > 80%
Core breadth of EE	Aware of emerging technologies and their impact in the future development of their field of study.	Transcripts analysis	Component GPA > 3.0
		Seniors survey	Satisfaction > 80%
		Alumni survey	Satisfaction > 80%
		Recruiter survey	Satisfaction > 80%
	Aware of current professional and societal issues.	Transcripts analysis	Component GPA > 3.0
		Seniors survey	Satisfaction > 80%
		Alumni survey	Satisfaction > 80%
		Recruiter survey	Satisfaction > 80%
	Able to differentiate between facts, beliefs, and opinions.	Transcripts analysis	Component GPA > 3.0
		Seniors survey	Satisfaction > 80%
		Alumni survey	Satisfaction > 80%
		Recruiter survey	Satisfaction > 80%
Option depth of EE	Aware of emerging technologies and their impact in the future development of their field of study.	Transcripts analysis	Component GPA > 3.0
		Seniors survey	Satisfaction > 80%
		Alumni survey	Satisfaction > 80%
		Recruiter survey	Satisfaction > 80%
	Aware of current professional and societal issues.	Transcripts analysis	Component GPA > 3.0
		Seniors survey	Satisfaction > 80%
		Alumni survey	Satisfaction > 80%
		Recruiter survey	Satisfaction > 80%
	Able to differentiate between facts, beliefs, and opinions.	Transcripts analysis	Component GPA > 3.0
		Seniors survey	Satisfaction > 80%
		Alumni survey	Satisfaction > 80%
		Recruiter survey	Satisfaction > 80%
Professional associations	Aware of current professional and societal issues.	Seniors survey	IEEE membership > 50%.
Participation in other extra-curricular activities	Aware of the need for their participation in civic movements not necessarily related to their discipline.	Alumni survey	IEEE membership > 50%.
		Seniors survey	Participation >25%.
		Alumni survey	Participation >25%.

Table 25. Assessment expectations for Outcome (k)

Program Component	Observation	Assessment Instruments	Assessment Metrics
Core breadth of EE	Able to use computers to solve engineering problems and to evaluate solutions.	Transcripts analysis	Component GPA >3.0
		Seniors survey	Satisfaction > 80%
		Alumni survey	Satisfaction > 80%
		Recruiter survey	Satisfaction > 80%
	Aware of current techniques and tools used in electrical engineering practice.	NCEES FE Examination	Seniors computer score > US
		Transcripts analysis	Component GPA >3.0
		Seniors survey	Satisfaction > 80%
		Alumni survey	Satisfaction > 80%
Option depth of EE	Able to use computers to solve engineering problems and to evaluate solutions.	Recruiter survey	Satisfaction > 80%
		NCEES FE Examination	Seniors passing rate > US
		Transcripts analysis	Component GPA >3.0
		Seniors survey	Satisfaction > 80%
	Aware of current techniques and tools used in electrical engineering practice.	Alumni survey	Satisfaction > 80%
		Recruiter survey	Satisfaction > 80%
		Transcripts analysis	Component GPA >3.0
		Seniors survey	Satisfaction > 80%
		Alumni survey	Satisfaction > 80%
		Recruiter survey	Satisfaction > 80%

5 Implementation of the assessment process

The assessment process is implemented through the use of the instruments to measure the observations. A better understanding is obtained when a matrix is created for every assessment instrument in terms of the objectives and outcomes that it would measure, with the addition of the observations and measurement expectations. The following tables present the matrices.

Table 26. Measurement expectations for the transcript evaluation instrument: Objectives

Transcript Analysis			
#	Component	Observation	Expectation
1	Language oral and written communications	Obtain a broad educational experience necessary to understand the impact of electrical engineering problems and solutions within a global and societal context.	Component GPA >3.0.
	Humanities and social sciences	Obtain a broad educational experience necessary to understand the impact of electrical engineering problems and solutions within a global and societal context.	Component GPA >3.0.
2	Mathematics	Thorough knowledge of math, science, and engineering fundamentals.	Component GPA >3.0.
	Physical sciences	Thorough knowledge of math, science, and engineering fundamentals. Physical thinking, approximation and simplification.	Component GPA >3.0.
	Fundamental knowledge of engineering sciences	Thorough knowledge of math, science, and engineering fundamentals. Physical thinking, approximation and simplification.	Component GPA >3.0.
	Fundamental knowledge of EE	Thorough knowledge of basic electrical and computer engineering fundamentals and concepts. Physical thinking, approximation and simplification.	Component GPA >3.0.
	Core breadth of EE	Basic engineering design skills and in-depth knowledge of at least one EE area: (electronics, control, communications, and power systems). Physical thinking, approximation and simplification.	Component GPA >3.0.
	Option depth of EE	Basic engineering design skills and in-depth knowledge of at least one EE area: (electronics, control, communications, and power systems). Ability to integrate knowledge and skills across discipline boundaries.	Component GPA >3.0.
3	Language oral and written communications	Develop ability to communicate effectively verbally and in writing in English and Spanish.	Component GPA >3.0.
	Humanities and social sciences	Develop ability to organize information; work in groups and to interact with the social environment.	Component GPA >3.0.
	Mathematics	Develop ability to interpret graphical, numerical, and textual data; communicate technical information in oral, written, and graphical forms, in English and Spanish.	Component GPA >3.0.
	Physical sciences	Develop ability to interpret graphical, numerical, and textual data; communicate technical information in oral, written, and graphical forms, in English and Spanish; organize information.	Component GPA >3.0.
	Fundamental knowledge of engineering sciences	Develop ability to interpret graphical, numerical, and textual data; communicate technical information in oral, written, and graphical forms, in English and Spanish; organize information.	Component GPA >3.0.
	Fundamental knowledge of EE	Develop ability to interpret graphical, numerical, and textual data; communicate technical information in oral, written, and graphical forms, in English and Spanish; organize information.	Component GPA >3.0.
	Core breadth of EE	Develop ability to interpret graphical, numerical, and textual data; communicate technical information in oral, written, and graphical forms, in English and Spanish; organize information.	Component GPA >3.0.
	Option depth of EE	Develop ability to interpret graphical, numerical, and textual data; communicate technical information in English and Spanish; organize information; work in groups and to interact with the social environment; and lead effectively.	Component GPA >3.0.
4	Core breadth of EE	Knowing how to ask questions and that there may be multiple answers. Commitment to constantly upgrading fundamental knowledge and skills. Understanding that every situation is an opportunity for learning.	Component GPA >3.0.
	Option depth of EE	Knowing how to ask questions and that there may be multiple answers. Commitment to constantly upgrading fundamental knowledge and skills. Understanding that every situation is an opportunity for learning.	Component GPA >3.0.

Transcript Analysis			
#	Component	Observation	Expectation
5	Humanities and social sciences	Develop ability to distinguish between ideas, opinions, beliefs, and facts; understand one's own cultural traditions in a broader context; consciousness of the ethical and societal aspects of their profession.	Component GPA >3.0.
	Core breadth of EE	Develop ability to distinguish between ideas, opinions, beliefs, and facts; consciousness of the ethical and societal aspects of their profession.	Component GPA >3.0.
	Option depth of EE	Develop ability to distinguish between ideas, opinions, beliefs, and facts; consciousness of the ethical and societal aspects of their profession.	Component GPA >3.0.

Table 27. Measurement expectations for the transcript evaluation instrument: Outcomes

Transcript Analysis			
#	Component	Observation	Expectation
A	Mathematics	Able to apply math, science, and engineering knowledge to electrical engineering problems.	Component GPA >3.0
		Able to apply probability and statistical methods in practical engineering problems where such approach is appropriate.	Subject GPA >3.00
	Physical sciences	Possess sufficient knowledge of the basic physical and engineering sciences that will enable them to understand the physical operation of electrical and electronic devices and systems.	Component GPA >3.00
	Fundamental knowledge of engineering sciences	Possess sufficient knowledge of the basic physical and engineering sciences that will enable them to understand the physical operation of electrical and electronic devices and systems.	Component GPA >3.0
	Fundamental knowledge of EE	Possess sufficient knowledge of the basic physical and engineering sciences that will enable them to understand the physical operation of electrical and electronic devices and systems.	Component GPA >3.0
	Core breadth of EE	Possess sufficient knowledge of the basic physical and engineering sciences that will enable them to understand the physical operation of electrical and electronic devices and systems.	Component GPA >3.0
	Option depth of EE	Possess sufficient knowledge of the basic physical and engineering sciences that will enable them to understand the physical operation of electrical and electronic devices and systems.	Component GPA >3.0
B	Mathematics	Able to graphically and verbally represent or describe experimental data sets.	Component GPA >3.0
	Physical sciences	Able to graphically and verbally represent or describe experimental data sets.	Component GPA >3.0
	Fundamental knowledge of EE	Able to solve an experimental electrical Engineering problem.	Component GPA >3.0
	Core breadth of EE	Able to solve an experimental electrical Engineering problem.	Component GPA >3.0
		Able to set up and safely perform engineering laboratory test procedures.	Component GPA >3.0
		Able to graphically and verbally represent or describe experimental data sets.	Component GPA >3.0
		Able to analyze, interpret, and draw conclusions based on experimental data.	Component GPA >3.0
	Option depth of EE	Able to design experiments and prototypes to test design concepts.	Component GPA >3.0
Option depth of EE	Able to design experiments and prototypes to test design concepts.	Component GPA >3.0	

Transcript Analysis				
#	Component	Observation	Expectation	
E	Mathematics	Capable of recognizing and understanding problem specifications, physical, and ethical constraints.	Component GPA >3.0	
	Physical sciences	Capable of recognizing and understanding problem specifications, physical, and ethical constraints.	Component GPA >3.0	
	Fundamental knowledge of engineering sciences	Capable of recognizing that they are facing an engineering problem.	Component GPA >3.0	
		Capable of recognizing and understanding problem specifications, physical, and ethical constraints.	Component GPA >3.0	
	Fundamental knowledge of EE	Capable of recognizing and understanding problem specifications, physical, and ethical constraints.	Component GPA >3.0	
		Capable of physical thinking, approximation and simplification.	Component GPA >3.0	
		Capable of effectively describe a problem in a way that can lead to the construction of the solution.	Component GPA >3.0	
		Capable of defining a possible solution.	Component GPA >3.0	
		Able to determine the reasonableness of a solution within the physical and ethical context of the problem.	Component GPA >3.0	
	Core breadth of EE	Capable of recognizing that they are facing an engineering problem.	Component GPA >3.0	
		Capable of recognizing and understanding problem specifications, physical, and ethical constraints.	Component GPA >3.0	
		Capable of physical thinking, approximation and simplification.	Component GPA >3.0	
		Capable of effectively describe a problem in a way that can lead to the construction of the solution.	Component GPA >3.0	
		Capable of defining a possible solution.	Component GPA >3.0	
	Option depth of EE	Able to determine the reasonableness of a solution within the physical and ethical context of the problem.	Component GPA >3.0	
		Capable of recognizing that they are facing an engineering problem.	Component GPA >3.0	
		Capable of recognizing and understanding problem specifications, physical, and ethical constraints.	Component GPA >3.0	
		Capable of physical thinking, approximation and simplification.	Component GPA >3.0	
		Capable of effectively describe a problem in a way that can lead to the construction of the solution.	Component GPA >3.0	
	G	Language oral and written communications	Able to write effectively and be understood by technical and non-technical audiences.	Component GPA >3.0
			Able to summarize their own work and the work of others.	Component GPA >3.0
Humanities and social sciences		Able to summarize their own work and the work of others.	Component GPA >3.0	
Mathematics		Able to communicate graphically where appropriate.	Component GPA >3.0	
Physical sciences		Able to communicate graphically where appropriate.	Component GPA >3.0	
Fundamental knowledge of engineering sciences		Able to communicate graphically where appropriate.	Component GPA >3.0	
Fundamental knowledge of EE		Able to communicate graphically where appropriate.	Component GPA >3.0	
Core breadth of EE		Able to summarize their own work and the work of others.	Component GPA >3.0	
		Able to communicate graphically where appropriate.	Component GPA >3.0	
Option depth of EE		Able to write effectively and be understood by technical and non-technical audiences.	Component GPA >3.0	
		Able to perform effective oral presentations and be understood by technical and non-technical audiences.	Component GPA >3.0	
	Able to summarize their own work and the work of others.	Component GPA >3.0		
		Able to communicate graphically where appropriate.	Component GPA >3.0	
H	Humanities and social sciences	Understand the impact of engineering solutions in a global and societal context.	Component GPA >3.0	
	Physical sciences	Aware of the long term implications of engineering solutions on the quality of life and the environment.	Component GPA >3.0	
	Fundamental knowledge of engineering sciences	Aware of the long term implications of engineering solutions on the quality of life and the environment.	Component GPA >3.0	

Transcript Analysis			
#	Component	Observation	Expectation
J	Option depth of EE	Able to differentiate between facts, beliefs, and opinions.	Overall Subject GPA >3.00
K	Core breadth of EE	Able to use computers to solve engineering problems and to evaluate solutions.	Component GPA >3.0
		Aware of current techniques and tools used in electrical engineering practice.	Component GPA >3.0
	Option depth of EE	Able to use computers to solve engineering problems and to evaluate solutions.	Component GPA >3.0
		Aware of current techniques and tools used in electrical engineering practice.	Component GPA >3.0

Table 28. Measurement expectations for the seniors survey instrument: Objectives

Seniors survey			
#	Component	Observation	Expectation
1	Language oral and written communications	Obtain a broad educational experience necessary to understand the impact of electrical engineering problems and solutions within a global and societal context.	Satisfaction > 80%
	Humanities and social sciences	Obtain a broad educational experience necessary to understand the impact of electrical engineering problems and solutions within a global and societal context.	Satisfaction > 80%
	Electives	Obtain a broad educational experience necessary to understand the impact of electrical engineering problems and solutions within a global and societal context.	Satisfaction > 80%
2	Mathematics	Thorough knowledge of math, science, and engineering fundamentals.	Satisfaction > 80%
	Physical sciences	Thorough knowledge of math, science, and engineering fundamentals. Physical thinking, approximation and simplification.	Satisfaction > 80%
	Fundamental knowledge of engineering sciences	Thorough knowledge of math, science, and engineering fundamentals. Physical thinking, approximation and simplification.	Satisfaction > 80%
	Fundamental knowledge of EE	Thorough knowledge of basic electrical and computer engineering fundamentals and concepts. Physical thinking, approximation and simplification.	Satisfaction > 80%
	Core breadth of EE	Basic engineering design skills and in-depth knowledge of at least one EE area: (electronics, control, communications, and power systems). Physical thinking, approximation and simplification.	Satisfaction > 80%
	Option depth of EE	Basic engineering design skills and in-depth knowledge of at least one EE area: (electronics, control, communications, and power systems). Ability to integrate knowledge and skills across discipline boundaries.	Satisfaction > 80%
3	Language oral and written communications	Develop ability to communicate effectively verbally and in writing in English and Spanish.	Satisfaction > 80%
	Humanities and social sciences	Develop ability to organize information; work in groups and to interact with the social environment.	Satisfaction > 80%
	Mathematics	Develop ability to interpret graphical, numerical, and textual data; communicate technical information in oral, written, and graphical forms, in English and Spanish.	Satisfaction > 80%
	Physical sciences	Develop ability to interpret graphical, numerical, and textual data; communicate technical information in oral, written, and graphical forms, in English and Spanish; organize information.	Satisfaction > 80%
	Fundamental knowledge of engineering sciences	Develop ability to interpret graphical, numerical, and textual data; communicate technical information in oral, written, and graphical forms, in English and Spanish; organize information.	Satisfaction > 80%
	Fundamental knowledge of EE	Develop ability to interpret graphical, numerical, and textual data; communicate technical information in oral, written, and graphical forms, in English and Spanish; organize information.	Satisfaction > 80%
	Core breadth of EE	Develop ability to interpret graphical, numerical, and textual data; communicate technical information in oral, written, and graphical forms, in English and Spanish; organize information.	Satisfaction > 80%
	Option depth of EE	Develop ability to interpret graphical, numerical, and textual data; communicate technical information in English and Spanish; organize information; work in groups and to interact with the social environment; and lead effectively.	Satisfaction > 80%
4	Core breadth of EE	Knowing how to ask questions and that there may be multiple answers. Commitment to constantly upgrading fundamental knowledge and skills. Understanding that every situation is an opportunity for learning.	Satisfaction > 80%
	Option depth of EE	Knowing how to ask questions and that there may be multiple answers. Commitment to constantly upgrading fundamental knowledge and skills. Understanding that every situation is an opportunity for learning.	Satisfaction > 80%

Seniors survey			
#	Component	Observation	Expectation
5	Humanities and social sciences	Develop ability to distinguish between ideas, opinions, beliefs, and facts; understand one's own cultural traditions in a broader context; consciousness of the ethical and societal aspects of their profession.	Satisfaction > 80%
	Core breadth of EE	Develop ability to distinguish between ideas, opinions, beliefs, and facts; consciousness of the ethical and societal aspects of their profession.	Satisfaction > 80%.
	Option depth of EE	Develop ability to distinguish between ideas, opinions, beliefs, and facts; consciousness of the ethical and societal aspects of their profession.	Satisfaction > 80%.
	Professional associations	Through their activities, professional associations provide their members with a broad view of the impact of external issues on engineering problems.	IEEE membership > 50%.
	Participation in other extracurricular activities	Participation in non- professional associations help in understanding society needs and expectations.	Participation >25%.

Table 29. Measurement expectations for the seniors survey instrument: Outcomes

Senior Survey			
#	Component	Observation	Expectation
A	Mathematics	Able to apply math, science, and engineering knowledge to electrical engineering problems.	Satisfaction > 80%
		Able to apply probability and statistical methods in practical engineering problems where such approach is appropriate.	Satisfaction > 80%
		Able to apply linear algebra concepts to the description and solution of EE engineering problems.	Satisfaction > 80%
		Able to apply complex variable concepts to the description and solution of EE engineering problems.	Satisfaction > 80%
		Able to apply discrete mathematics concepts to the description and solution of EE engineering problems.	Satisfaction > 80%
	Physical sciences	Possess sufficient knowledge of the basic physical and engineering sciences that will enable them to understand the physical operation of electrical and electronic devices and systems.	Satisfaction > 80%
	Fundamental knowledge of engineering sciences	Possess sufficient knowledge of the basic physical and engineering sciences that will enable them to understand the physical operation of electrical and electronic devices and systems.	Satisfaction > 80%
	Fundamental knowledge of EE	Possess sufficient knowledge of the basic physical and engineering sciences that will enable them to understand the physical operation of electrical and electronic devices and systems.	Satisfaction > 80%
	Core breadth of EE	Possess sufficient knowledge of the basic physical and engineering sciences that will enable them to understand the physical operation of electrical and electronic devices and systems.	Satisfaction > 80%
	Option depth of EE	Possess sufficient knowledge of the basic physical and engineering sciences that will enable them to understand the physical operation of electrical and electronic devices and systems.	Satisfaction > 80%

Senior Survey			
#	Component	Observation	Expectation
B	Mathematics	Able to graphically and verbally represent or describe experimental data sets.	Satisfaction > 80%
	Physical sciences	Able to graphically and verbally represent or describe experimental data sets.	Satisfaction > 80%
	Fundamental knowledge of EE	Able to solve an experimental electrical Engineering problem.	Satisfaction > 80%
	Core breadth of EE	Able to solve an experimental electrical Engineering problem.	Satisfaction > 80%
		Able to set up and safely perform engineering laboratory test procedures.	Satisfaction > 80%
		Able to graphically and verbally represent or describe experimental data sets.	Satisfaction > 80%
		Able to analyze, interpret, and draw conclusions based on experimental data.	Satisfaction > 80%
Option depth of EE	Able to design experiments and prototypes to test design concepts.	Satisfaction > 80%	
C	Core breadth of EE	Competent in determining design specifications and the scope of the project.	Satisfaction > 80%
		Able to determine the standard or criteria against which the outcome of the design process will be measured or compared.	Satisfaction > 80%
		Competent in documenting design procedures.	Satisfaction > 80%
		Able to follow logical and orderly design procedures, choosing the best solution for a given set of criteria.	Satisfaction > 80%
	Option depth of EE	Competent in determining design specifications and the scope of the project.	Satisfaction > 80%
		Able to determine the standard or criteria against which the outcome of the design process will be measured or compared.	Satisfaction > 80%
		Competent in documenting design procedures.	Satisfaction > 80%
D	Language oral and written communications	Able to communicate effectively with other team members.	Satisfaction > 80%
	Humanities and social sciences	Understand the basic terminology used in other disciplines.	Satisfaction > 80%
	Electives	Understand the basic terminology used in other disciplines.	Satisfaction > 80%
	Mathematics	Able to communicate effectively with other team members.	Satisfaction > 80%
	Physical sciences	Understand the basic terminology used in other disciplines.	Satisfaction > 80%
	Fundamental knowledge of engineering sciences	Understand the basic terminology used in other disciplines.	Satisfaction > 80%
	Core breadth of EE	Able to articulate teamwork principles (group dynamics).	Satisfaction > 80%
		Comfortable breaking up a complex problem into separate tasks, delegating tasks to other team members, and integrating the composite effort of the group into a final solution.	Satisfaction > 80%
		Graduates will be able to integrate knowledge and skills across discipline boundaries.	Satisfaction > 80%
		Able to communicate effectively with other team members.	Satisfaction > 80%
	Option depth of EE	Able to articulate teamwork principles (group dynamics).	Satisfaction > 80%
		Graduates will be able to integrate knowledge and skills across discipline boundaries.	Satisfaction > 80%
		Able to communicate effectively with other team members.	Satisfaction > 80%

Senior Survey			
#	Component	Observation	Expectation
E	Mathematics	Capable of recognizing and understanding problem specifications, physical, and ethical constraints.	Satisfaction > 80%
	Physical sciences	Capable of recognizing and understanding problem specifications, physical, and ethical constraints.	Satisfaction > 80%
	Fundamental knowledge of engineering sciences	Capable of recognizing that they are facing an engineering problem.	Satisfaction > 80%
		Capable of recognizing and understanding problem specifications, physical, and ethical constraints.	Satisfaction > 80%
	Fundamental knowledge of EE	Capable of recognizing and understanding problem specifications, physical, and ethical constraints.	Satisfaction > 80%
		Capable of physical thinking, approximation and simplification.	Satisfaction > 80%
		Capable of effectively describe a problem in a way that can lead to the construction of the solution.	Satisfaction > 80%
		Capable of defining a possible solution.	Satisfaction > 80%
		Able to determine the reasonableness of a solution within the physical and ethical context of the problem.	Satisfaction > 80%
	Core breadth of EE	Capable of recognizing that they are facing an engineering problem.	Satisfaction > 80%
		Capable of recognizing and understanding problem specifications, physical, and ethical constraints.	Satisfaction > 80%
		Capable of physical thinking, approximation and simplification.	Satisfaction > 80%
		Capable of effectively describe a problem in a way that can lead to the construction of the solution.	Satisfaction > 80%
		Capable of defining a possible solution.	Satisfaction > 80%
	Option depth of EE	Able to determine the reasonableness of a solution within the physical and ethical context of the problem.	Satisfaction > 80%
		Capable of recognizing that they are facing an engineering problem.	Satisfaction > 80%
		Capable of recognizing and understanding problem specifications, physical, and ethical constraints.	Satisfaction > 80%
		Capable of physical thinking, approximation and simplification.	Satisfaction > 80%
		Capable of effectively describe a problem in a way that can lead to the construction of the solution.	Satisfaction > 80%
	F	Humanities and social sciences	Capable of defining a possible solution.
Able to determine the reasonableness of a solution within the physical and ethical context of the problem.			Satisfaction > 80%
Fundamental knowledge of engineering sciences		Capable of recognizing that they are facing an engineering problem.	Satisfaction > 80%
		Capable of recognizing and understanding problem specifications, physical, and ethical constraints.	Satisfaction > 80%
Fundamental knowledge of EE		Capable of physical thinking, approximation and simplification.	Satisfaction > 80%
		Capable of effectively describe a problem in a way that can lead to the construction of the solution.	Satisfaction > 80%
Core breadth of EE		Capable of defining a possible solution.	Satisfaction > 80%
		Able to determine the reasonableness of a solution within the physical and ethical context of the problem.	Satisfaction > 80%
Option depth of EE	Understand the proper use of the work of others and issues such as plagiarism, copyrights, and patents.	Satisfaction > 80%	
	Able to identify the ethical issues faced on the solution of an engineering problem.	Satisfaction > 80%	
Professional associations	Aware and can interpret the IEEE Code of Ethics.	IEEE membership > 50%.	
Participation in other extracurricular activities	Able to identify the ethical issues faced on the solution of an engineering problem.	Participation >25%.	

Senior Survey			
#	Component	Observation	Expectation
G	Language oral and written communications	Able to write effectively and be understood by technical and non-technical audiences.	Satisfaction > 80%
		Able to summarize their own work and the work of others.	Satisfaction > 80%
	Humanities and social sciences	Able to summarize their own work and the work of others.	Satisfaction > 80%
	Mathematics	Able to communicate graphically where appropriate.	Satisfaction > 80%
	Physical sciences	Able to communicate graphically where appropriate.	Satisfaction > 80%
	Fundamental knowledge of engineering sciences	Able to communicate graphically where appropriate.	Satisfaction > 80%
	Fundamental knowledge of EE	Able to communicate graphically where appropriate.	Satisfaction > 80%
	Core breadth of EE	Able to summarize their own work and the work of others.	Satisfaction > 80%
		Able to communicate graphically where appropriate.	Satisfaction > 80%
	Option depth of EE	Able to write effectively and be understood by technical and non-technical audiences.	Satisfaction > 80%
Able to perform effective oral presentations and be understood by technical and non-technical audiences.		Satisfaction > 80%	
Able to summarize their own work and the work of others.		Satisfaction > 80%	
Able to communicate graphically where appropriate.		Satisfaction > 80%	
H	Humanities and social sciences	Understand the impact of engineering solutions in a global and societal context.	Satisfaction > 80%
	Electives	Understand the impact of engineering solutions in a global and societal context.	Satisfaction > 80%
	Physical sciences	Aware of the long term implications of engineering solutions on the quality of life and the environment.	Satisfaction > 80%
	Fundamental knowledge of engineering sciences	Aware of the long term implications of engineering solutions on the quality of life and the environment.	Satisfaction > 80%
I	Electives	Capable of independent learning and in the search for information.	Satisfaction > 80%
	Core breadth of EE	Capable of using information searching tools and resources necessary to be up to date in their discipline.	Satisfaction > 80%
	Option depth of EE	Capable of using information searching tools and resources necessary to be up to date in their discipline.	Satisfaction > 80%
	Professional associations	Understand the importance of professional societies in their professional development.	IEEE membership > 50 %.
J	Humanities and social sciences	Aware of current professional and societal issues.	Satisfaction > 80%
		Able to differentiate between facts, beliefs, and opinions.	Satisfaction > 80%
	Core breadth of EE	Aware of emerging technologies and their impact in the future development of their field of study.	Satisfaction > 80%
		Aware of current professional and societal issues.	Satisfaction > 80%
	Option depth of EE	Able to differentiate between facts, beliefs, and opinions.	Satisfaction > 80%
		Aware of emerging technologies and their impact in the future development of their field of study.	Satisfaction > 80%
	Professional associations	Aware of current professional and societal issues.	Satisfaction > 80%
		Able to differentiate between facts, beliefs, and opinions.	Satisfaction > 80%
Participation in other extracurricular activities	Aware of the need for their participation in civic movements not necessarily related to their discipline.	IEEE membership > 50%. Participation >25%.	
K	Core breadth of EE	Able to use computers to solve engineering problems and to evaluate solutions.	Satisfaction > 80%
		Aware of current techniques and tools used in electrical engineering practice.	Satisfaction > 80%
	Option depth of EE	Able to use computers to solve engineering problems and to evaluate solutions.	Satisfaction > 80%
		Aware of current techniques and tools used in electrical engineering practice.	Satisfaction > 80%

Table 30. Measurement expectations for the alumni survey instrument: Objectives

Alumni Survey			
#	Component	Observation	Expectation
1	Language oral and written communications	Obtain a broad educational experience necessary to understand the impact of electrical engineering problems and solutions within a global and societal context.	Satisfaction > 80%
	Humanities and social sciences	Obtain a broad educational experience necessary to understand the impact of electrical engineering problems and solutions within a global and societal context.	Satisfaction > 80%
	Electives	Obtain a broad educational experience necessary to understand the impact of electrical engineering problems and solutions within a global and societal context.	Satisfaction > 80%
2	Mathematics	Thorough knowledge of math, science, and engineering fundamentals.	Satisfaction > 80%
	Physical sciences	Thorough knowledge of math, science, and engineering fundamentals. Physical thinking, approximation and simplification.	Satisfaction > 80%
	Fundamental knowledge of engineering sciences	Thorough knowledge of math, science, and engineering fundamentals. Physical thinking, approximation and simplification.	Satisfaction > 80%
	Fundamental knowledge of EE	Thorough knowledge of basic electrical and computer engineering fundamentals and concepts. Physical thinking, approximation and simplification.	Satisfaction > 80%
	Core breadth of EE	Basic engineering design skills and in-depth knowledge of at least one EE area: (electronics, control, communications, and power systems). Physical thinking, approximation and simplification.	Satisfaction > 80%
	Option depth of EE	Basic engineering design skills and in-depth knowledge of at least one EE area: (electronics, control, communications, and power systems). Ability to integrate knowledge and skills across discipline boundaries.	Satisfaction > 80%
3	Language oral and written communications	Develop ability to communicate effectively verbally and in writing in English and Spanish.	Satisfaction > 80%
	Humanities and social sciences	Develop ability to organize information; work in groups and to interact with the social environment.	Satisfaction > 80%
	Mathematics	Develop ability to interpret graphical, numerical, and textual data; communicate technical information in oral, written, and graphical forms, in English and Spanish.	Satisfaction > 80%
	Physical sciences	Develop ability to interpret graphical, numerical, and textual data; communicate technical information in oral, written, and graphical forms, in English and Spanish; organize information.	Satisfaction > 80%
	Fundamental knowledge of engineering sciences	Develop ability to interpret graphical, numerical, and textual data; communicate technical information in oral, written, and graphical forms, in English and Spanish; organize information.	Satisfaction > 80%
	Fundamental knowledge of EE	Develop ability to interpret graphical, numerical, and textual data; communicate technical information in oral, written, and graphical forms, in English and Spanish; organize information.	Satisfaction > 80%
	Core breadth of EE	Develop ability to interpret graphical, numerical, and textual data; communicate technical information in oral, written, and graphical forms, in English and Spanish; organize information.	Satisfaction > 80%
	Option depth of EE	Develop ability to interpret graphical, numerical, and textual data; communicate technical information in English and Spanish; organize information; work in groups and to interact with the social environment; and lead effectively.	Satisfaction > 80%
4	Core breadth of EE	Knowing how to ask questions and that there may be multiple answers. Commitment to constantly upgrading fundamental knowledge and skills. Understanding that every situation is an opportunity for learning.	Satisfaction > 80%
	Option depth of EE	Knowing how to ask questions and that there may be multiple answers. Commitment to constantly upgrading fundamental knowledge and skills. Understanding that every situation is an opportunity for learning.	Satisfaction > 80%

Alumni Survey			
#	Component	Observation	Expectation
5	Humanities and social sciences	Develop ability to distinguish between ideas, opinions, beliefs, and facts; understand one's own cultural traditions in a broader context; consciousness of the ethical and societal aspects of their profession.	Satisfaction > 80%
	Core breadth of EE	Develop ability to distinguish between ideas, opinions, beliefs, and facts; consciousness of the ethical and societal aspects of their profession.	Satisfaction > 80%.
	Option depth of EE	Develop ability to distinguish between ideas, opinions, beliefs, and facts; consciousness of the ethical and societal aspects of their profession.	Satisfaction > 80%.
	Professional associations	Through their activities, professional associations provide their members with a broad view of the impact of external issues on engineering problems.	IEEE membership > 50%.
	Participation in other extracurricular activities	Participation in non- professional associations help in understanding society needs and expectations.	Participation >25%.

Table 31. Measurement expectations for the alumni survey instrument: Outcomes

Alumni Survey			
#	Component	Observation	Expectation
A	Mathematics	Able to apply math, science, and engineering knowledge to electrical engineering problems.	Satisfaction > 80%
		Able to apply probability and statistical methods in practical engineering problems where such approach is appropriate.	Satisfaction > 80%
		Able to apply linear algebra concepts to the description and solution of EE engineering problems.	Satisfaction > 80%
		Able to apply complex variable concepts to the description and solution of EE engineering problems.	Satisfaction > 80%
		Able to apply discrete mathematics concepts to the description and solution of EE engineering problems.	Satisfaction > 80%
	Physical sciences	Possess sufficient knowledge of the basic physical and engineering sciences that will enable them to understand the physical operation of electrical and electronic devices and systems.	Satisfaction > 80%
	Fundamental knowledge of engineering sciences	Possess sufficient knowledge of the basic physical and engineering sciences that will enable them to understand the physical operation of electrical and electronic devices and systems.	Satisfaction > 80%
	Fundamental knowledge of EE	Possess sufficient knowledge of the basic physical and engineering sciences that will enable them to understand the physical operation of electrical and electronic devices and systems.	Satisfaction > 80%
	Core breadth of EE	Possess sufficient knowledge of the basic physical and engineering sciences that will enable them to understand the physical operation of electrical and electronic devices and systems.	Satisfaction > 80%
	Option depth of EE	Possess sufficient knowledge of the basic physical and engineering sciences that will enable them to understand the physical operation of electrical and electronic devices and systems.	Satisfaction > 80%
B	Mathematics	Able to graphically and verbally represent or describe experimental data sets.	Satisfaction > 80%
	Physical sciences	Able to graphically and verbally represent or describe experimental data sets.	Satisfaction > 80%
	Fundamental knowledge of EE	Able to solve an experimental electrical Engineering problem.	Satisfaction > 80%
	Core breadth of EE	Able to solve an experimental electrical Engineering problem.	Satisfaction > 80%
		Able to set up and safely perform engineering laboratory test procedures.	Satisfaction > 80%
		Able to graphically and verbally represent or describe experimental data sets.	Satisfaction > 80%
		Able to analyze, interpret, and draw conclusions based on experimental data.	Satisfaction > 80%
	Option depth of EE	Able to design experiments and prototypes to test design concepts.	Satisfaction > 80%

Alumni Survey			
#	Component	Observation	Expectation
C	Core breadth of EE	Competent in determining design specifications and the scope of the project.	Satisfaction > 80%
		Able to determine the standard or criteria against which the outcome of the design process will be measured or compared.	Satisfaction > 80%
		Competent in documenting design procedures.	Satisfaction > 80%
		Able to follow logical and orderly design procedures, choosing the best solution for a given set of criteria.	Satisfaction > 80%
	Option depth of EE	Competent in determining design specifications and the scope of the project.	Satisfaction > 80%
		Able to determine the standard or criteria against which the outcome of the design process will be measured or compared.	Satisfaction > 80%
		Competent in documenting design procedures.	Satisfaction > 80%
		Able to follow logical and orderly design procedures, choosing the best solution for a given set of criteria.	Satisfaction > 80%
D	Language oral and written communications	Able to communicate effectively with other team members.	Satisfaction > 80%
	Humanities and social sciences	Understand the basic terminology used in other disciplines.	Satisfaction > 80%
	Electives	Understand the basic terminology used in other disciplines.	Satisfaction > 80%
	Mathematics	Able to communicate effectively with other team members.	Satisfaction > 80%
	Physical sciences	Understand the basic terminology used in other disciplines.	Satisfaction > 80%
	Fundamental knowledge of engineering sciences	Understand the basic terminology used in other disciplines.	Satisfaction > 80%
	Core breadth of EE	Able to articulate teamwork principles (group dynamics).	Satisfaction > 80%
		Comfortable breaking up a complex problem into separate tasks, delegating tasks to other team members, and integrating the composite effort of the group into a final solution.	Satisfaction > 80%
		Graduates will be able to integrate knowledge and skills across discipline boundaries.	Satisfaction > 80%
		Able to communicate effectively with other team members.	Satisfaction > 80%
Option depth of EE	Able to articulate teamwork principles (group dynamics).	Satisfaction > 80%	
	Comfortable breaking up a complex problem into separate tasks, delegating tasks to other team members, and integrating the composite effort of the group into a final solution.	Satisfaction > 80%	
	Graduates will be able to integrate knowledge and skills across discipline boundaries.	Satisfaction > 80%	
	Able to communicate effectively with other team members.	Satisfaction > 80%	

Alumni Survey			
#	Component	Observation	Expectation
E	Mathematics	Capable of recognizing and understanding problem specifications, physical, and ethical constraints.	Satisfaction > 80%
	Physical sciences	Capable of recognizing and understanding problem specifications, physical, and ethical constraints.	Satisfaction > 80%
	Fundamental knowledge of engineering sciences	Capable of recognizing that they are facing an engineering problem.	Satisfaction > 80%
		Capable of recognizing and understanding problem specifications, physical, and ethical constraints.	Satisfaction > 80%
	Fundamental knowledge of EE	Capable of recognizing and understanding problem specifications, physical, and ethical constraints.	Satisfaction > 80%
		Capable of physical thinking, approximation and simplification.	Satisfaction > 80%
		Capable of effectively describe a problem in a way that can lead to the construction of the solution.	Satisfaction > 80%
		Capable of defining a possible solution.	Satisfaction > 80%
		Able to determine the reasonableness of a solution within the physical and ethical context of the problem.	Satisfaction > 80%
	Core breadth of EE	Capable of recognizing that they are facing an engineering problem.	Satisfaction > 80%
		Capable of recognizing and understanding problem specifications, physical, and ethical constraints.	Satisfaction > 80%
		Capable of physical thinking, approximation and simplification.	Satisfaction > 80%
		Capable of effectively describe a problem in a way that can lead to the construction of the solution.	Satisfaction > 80%
		Capable of defining a possible solution.	Satisfaction > 80%
	Option depth of EE	Able to determine the reasonableness of a solution within the physical and ethical context of the problem.	Satisfaction > 80%
		Capable of recognizing that they are facing an engineering problem.	Satisfaction > 80%
		Capable of recognizing and understanding problem specifications, physical, and ethical constraints.	Satisfaction > 80%
		Capable of physical thinking, approximation and simplification.	Satisfaction > 80%
		Capable of effectively describe a problem in a way that can lead to the construction of the solution.	Satisfaction > 80%
	F	Humanities and social sciences	Capable of defining a possible solution.
Able to determine the reasonableness of a solution within the physical and ethical context of the problem.			Satisfaction > 80%
Fundamental knowledge of engineering sciences		Capable of recognizing that they are facing an engineering problem.	Satisfaction > 80%
		Capable of recognizing and understanding problem specifications, physical, and ethical constraints.	Satisfaction > 80%
Fundamental knowledge of EE		Capable of physical thinking, approximation and simplification.	Satisfaction > 80%
		Capable of effectively describe a problem in a way that can lead to the construction of the solution.	Satisfaction > 80%
Core breadth of EE		Capable of defining a possible solution.	Satisfaction > 80%
		Able to determine the reasonableness of a solution within the physical and ethical context of the problem.	Satisfaction > 80%
Option depth of EE	Understand the proper use of the work of others and issues such as plagiarism, copyrights, and patents.	Satisfaction > 80%	
	Able to identify the ethical issues faced on the solution of an engineering problem.	Satisfaction > 80%	
Professional associations	Aware and can interpret the IEEE Code of Ethics.	IEEE membership > 50 %.	
Participation in other extracurricular activities	Able to identify the ethical issues faced on the solution of an engineering problem.	Participation >25 %.	

Alumni Survey			
#	Component	Observation	Expectation
G	Language oral and written communications	Able to write effectively and be understood by technical and non-technical audiences.	Satisfaction > 80%
		Able to summarize their own work and the work of others.	Satisfaction > 80%
	Humanities and social sciences	Able to summarize their own work and the work of others.	Satisfaction > 80%
	Mathematics	Able to communicate graphically where appropriate.	Satisfaction > 80%
	Physical sciences	Able to communicate graphically where appropriate.	Satisfaction > 80%
	Fundamental knowledge of engineering sciences	Able to communicate graphically where appropriate.	Satisfaction > 80%
	Fundamental knowledge of EE	Able to communicate graphically where appropriate.	Satisfaction > 80%
	Core breadth of EE	Able to summarize their own work and the work of others.	Satisfaction > 80%
		Able to communicate graphically where appropriate.	Satisfaction > 80%
	Option depth of EE	Able to write effectively and be understood by technical and non-technical audiences.	Satisfaction > 80%
Able to perform effective oral presentations and be understood by technical and non-technical audiences.		Satisfaction > 80%	
Able to summarize their own work and the work of others.		Satisfaction > 80%	
		Able to communicate graphically where appropriate.	Satisfaction > 80%
H	Humanities and social sciences	Understand the impact of engineering solutions in a global and societal context.	Satisfaction > 80%
	Electives	Understand the impact of engineering solutions in a global and societal context.	Satisfaction > 80%
	Physical sciences	Aware of the long term implications of engineering solutions on the quality of life and the environment.	Satisfaction > 80%
	Fundamental knowledge of engineering sciences	Aware of the long term implications of engineering solutions on the quality of life and the environment.	Satisfaction > 80%
I	Electives	Capable of independent learning and in the search for information.	Satisfaction > 80%
	Core breadth of EE	Capable of using information searching tools and resources necessary to be up to date in their discipline.	Satisfaction > 80%
	Option depth of EE	Capable of using information searching tools and resources necessary to be up to date in their discipline.	Satisfaction > 80%
	Professional associations	Understand the importance of professional societies in their professional development.	IEEE membership > 50 %.
J	Humanities and social sciences	Aware of current professional and societal issues.	Satisfaction > 80%
		Able to differentiate between facts, beliefs, and opinions.	Satisfaction > 80%
	Core breadth of EE	Aware of emerging technologies and their impact in the future development of their field of study.	Satisfaction > 80%
		Aware of current professional and societal issues.	Satisfaction > 80%
	Option depth of EE	Able to differentiate between facts, beliefs, and opinions.	Satisfaction > 80%
		Aware of emerging technologies and their impact in the future development of their field of study.	Satisfaction > 80%
		Aware of current professional and societal issues.	Satisfaction > 80%
		Able to differentiate between facts, beliefs, and opinions.	Satisfaction > 80%
Professional associations	Aware of current professional and societal issues.	IEEE membership > 50 %.	
Participation in other extracurricular activities	Aware of the need for their participation in civic movements not necessarily related to their discipline.	Participation >25 %.	
K	Core breadth of EE	Able to use computers to solve engineering problems and to evaluate solutions.	Satisfaction > 80%
		Aware of current techniques and tools used in electrical engineering practice.	Satisfaction > 80%
	Option depth of EE	Able to use computers to solve engineering problems and to evaluate solutions.	Satisfaction > 80%
		Aware of current techniques and tools used in electrical engineering practice.	Satisfaction > 80%

Table 32. Measurement expectations for the recruiters survey instrument: Objectives

Recruiters Survey			
#	Component	Observation	Expectation
2	Mathematics	Thorough knowledge of math, science, and engineering fundamentals.	Satisfaction > 80%
	Physical sciences	Thorough knowledge of math, science, and engineering fundamentals. Physical thinking, approximation and simplification.	Satisfaction > 80%
	Fundamental knowledge of engineering sciences	Thorough knowledge of math, science, and engineering fundamentals. Physical thinking, approximation and simplification.	Satisfaction > 80%
	Fundamental knowledge of EE	Thorough knowledge of basic electrical and computer engineering fundamentals and concepts. Physical thinking, approximation and simplification.	Satisfaction > 80%
	Core breadth of EE	Basic engineering design skills and in-depth knowledge of at least one EE area: (electronics, control, communications, and power systems). Physical thinking, approximation and simplification.	Satisfaction > 80%
	Option depth of EE	Basic engineering design skills and in-depth knowledge of at least one EE area: (electronics, control, communications, and power systems). Ability to integrate knowledge and skills across discipline boundaries.	Satisfaction > 80%
3	Language oral and written communications	Develop ability to communicate effectively verbally and in writing in English and Spanish.	Satisfaction > 80%
	Humanities and social sciences	Develop ability to organize information; work in groups and to interact with the social environment.	Satisfaction > 80%
	Mathematics	Develop ability to interpret graphical, numerical, and textual data; communicate technical information in oral, written, and graphical forms, in English and Spanish.	Satisfaction > 80%
	Physical sciences	Develop ability to interpret graphical, numerical, and textual data; communicate technical information in oral, written, and graphical forms, in English and Spanish; organize information.	Satisfaction > 80%
	Fundamental knowledge of engineering sciences	Develop ability to interpret graphical, numerical, and textual data; communicate technical information in oral, written, and graphical forms, in English and Spanish; organize information.	Satisfaction > 80%
	Fundamental knowledge of EE	Develop ability to interpret graphical, numerical, and textual data; communicate technical information in oral, written, and graphical forms, in English and Spanish; organize information.	Satisfaction > 80%
	Core breadth of EE	Develop ability to interpret graphical, numerical, and textual data; communicate technical information in oral, written, and graphical forms, in English and Spanish; organize information.	Satisfaction > 80%
	Option depth of EE	Develop ability to interpret graphical, numerical, and textual data; communicate technical information in English and Spanish; organize information; work in groups and to interact with the social environment; and lead effectively.	Satisfaction > 80%
5	Humanities and social sciences	Develop ability to distinguish between ideas, opinions, beliefs, and facts; understand one's own cultural traditions in a broader context; consciousness of the ethical and societal aspects of their profession.	Satisfaction > 80%
	Core breadth of EE	Develop ability to distinguish between ideas, opinions, beliefs, and facts; consciousness of the ethical and societal aspects of their profession.	Satisfaction > 80%.
	Option depth of EE	Develop ability to distinguish between ideas, opinions, beliefs, and facts; consciousness of the ethical and societal aspects of their profession.	Satisfaction > 80%.

Table 33. Measurement expectations for the recruiters survey instrument: Outcomes

Recruiters Survey			
#	Component	Observation	Expectation
A	Mathematics	Able to apply math, science, and engineering knowledge to electrical engineering problems.	Satisfaction > 80%
		Able to apply probability and statistical methods in practical engineering problems where such approach is appropriate.	Satisfaction > 80%
		Able to apply linear algebra concepts to the description and solution of EE engineering problems.	Satisfaction > 80%
		Able to apply complex variable concepts to the description and solution of EE engineering problems.	Satisfaction > 80%
		Able to apply discrete mathematics concepts to the description and solution of EE engineering problems.	Satisfaction > 80%
	Physical sciences	Possess sufficient knowledge of the basic physical and engineering sciences that will enable them to understand the physical operation of electrical and electronic devices and systems.	Satisfaction > 80%
	Fundamental knowledge of engineering sciences	Possess sufficient knowledge of the basic physical and engineering sciences that will enable them to understand the physical operation of electrical and electronic devices and systems.	Satisfaction > 80%
	Fundamental knowledge of EE	Possess sufficient knowledge of the basic physical and engineering sciences that will enable them to understand the physical operation of electrical and electronic devices and systems.	Satisfaction > 80%
	Core breadth of EE	Possess sufficient knowledge of the basic physical and engineering sciences that will enable them to understand the physical operation of electrical and electronic devices and systems.	Satisfaction > 80%
	Option depth of EE	Possess sufficient knowledge of the basic physical and engineering sciences that will enable them to understand the physical operation of electrical and electronic devices and systems.	Satisfaction > 80%
B	Mathematics	Able to graphically and verbally represent or describe experimental data sets.	Satisfaction > 80%
	Physical sciences	Able to graphically and verbally represent or describe experimental data sets.	Satisfaction > 80%
	Fundamental knowledge of EE	Able to solve an experimental electrical Engineering problem.	Satisfaction > 80%
	Core breadth of EE	Able to solve an experimental electrical Engineering problem.	Satisfaction > 80%
		Able to set up and safely perform engineering laboratory test procedures.	Satisfaction > 80%
		Able to graphically and verbally represent or describe experimental data sets.	Satisfaction > 80%
		Able to analyze, interpret, and draw conclusions based on experimental data.	Satisfaction > 80%
Option depth of EE	Able to design experiments and prototypes to test design concepts.	Satisfaction > 80%	
C	Core breadth of EE	Competent in determining design specifications and the scope of the project.	Satisfaction > 80%
		Able to determine the standard or criteria against which the outcome of the design process will be measured or compared.	Satisfaction > 80%
		Competent in documenting design procedures.	Satisfaction > 80%
		Able to follow logical and orderly design procedures, choosing the best solution for a given set of criteria.	Satisfaction > 80%
	Option depth of EE	Competent in determining design specifications and the scope of the project.	Satisfaction > 80%
		Able to determine the standard or criteria against which the outcome of the design process will be measured or compared.	Satisfaction > 80%
		Competent in documenting design procedures.	Satisfaction > 80%
		Able to follow logical and orderly design procedures, choosing the best solution for a given set of criteria.	Satisfaction > 80%

Recruiters Survey				
#	Component	Observation	Expectation	
D	Language oral and written communications	Able to communicate effectively with other team members.	Satisfaction > 80%	
	Humanities and social sciences	Understand the basic terminology used in other disciplines.	Satisfaction > 80%	
	Mathematics	Understand the basic terminology used in other disciplines.	Satisfaction > 80%	
	Physical sciences	Understand the basic terminology used in other disciplines.	Satisfaction > 80%	
	Fundamental knowledge of engineering sciences	Understand the basic terminology used in other disciplines.	Satisfaction > 80%	
	Core breadth of EE		Able to articulate teamwork principles (group dynamics).	Satisfaction > 80%
			Comfortable breaking up a complex problem into separate tasks, delegating tasks to other team members, and integrating the composite effort of the group into a final solution.	Satisfaction > 80%
			Graduates will be able to integrate knowledge and skills across discipline boundaries.	Satisfaction > 80%
			Able to communicate effectively with other team members.	Satisfaction > 80%
	Option depth of EE		Able to articulate teamwork principles (group dynamics).	Satisfaction > 80%
			Comfortable breaking up a complex problem into separate tasks, delegating tasks to other team members, and integrating the composite effort of the group into a final solution.	Satisfaction > 80%
			Graduates will be able to integrate knowledge and skills across discipline boundaries.	Satisfaction > 80%
			Able to communicate effectively with other team members.	Satisfaction > 80%
	E	Mathematics	Capable of recognizing and understanding problem specifications, physical, and ethical constraints.	Satisfaction > 80%
Physical sciences		Capable of recognizing and understanding problem specifications, physical, and ethical constraints.	Satisfaction > 80%	
Fundamental knowledge of engineering sciences		Capable of recognizing that they are facing an engineering problem.	Satisfaction > 80%	
		Capable of recognizing and understanding problem specifications, physical, and ethical constraints.	Satisfaction > 80%	
Fundamental knowledge of EE		Capable of recognizing and understanding problem specifications, physical, and ethical constraints.	Satisfaction > 80%	
		Capable of physical thinking, approximation and simplification.	Satisfaction > 80%	
		Capable of effectively describe a problem in a way that can lead to the construction of the solution.	Satisfaction > 80%	
		Capable of defining a possible solution.	Satisfaction > 80%	
		Able to determine the reasonableness of a solution within the physical and ethical context of the problem.	Satisfaction > 80%	
Core breadth of EE		Capable of recognizing that they are facing an engineering problem.	Satisfaction > 80%	
		Capable of recognizing and understanding problem specifications, physical, and ethical constraints.	Satisfaction > 80%	
		Capable of physical thinking, approximation and simplification.	Satisfaction > 80%	
		Capable of effectively describe a problem in a way that can lead to the construction of the solution.	Satisfaction > 80%	
		Capable of defining a possible solution.	Satisfaction > 80%	
Option depth of EE		Able to determine the reasonableness of a solution within the physical and ethical context of the problem.	Satisfaction > 80%	
		Capable of recognizing that they are facing an engineering problem.	Satisfaction > 80%	
		Capable of recognizing and understanding problem specifications, physical, and ethical constraints.	Satisfaction > 80%	
		Capable of physical thinking, approximation and simplification.	Satisfaction > 80%	
		Capable of effectively describe a problem in a way that can lead to the construction of the solution.	Satisfaction > 80%	
Option depth of EE			Capable of defining a possible solution.	Satisfaction > 80%
	Able to determine the reasonableness of a solution within the physical and ethical context of the problem.		Satisfaction > 80%	

Recruiters Survey			
#	Component	Observation	Expectation
F	Humanities and social sciences	Able to identify the ethical issues faced on the solution of an engineering problem.	Satisfaction > 80%
	Fundamental knowledge of engineering sciences	Able to identify the ethical issues faced on the solution of an engineering problem.	Satisfaction > 80%
	Fundamental knowledge of EE	Able to identify the ethical issues faced on the solution of an engineering problem.	Satisfaction > 80%
	Core breadth of EE	Able to identify the ethical issues faced on the solution of an engineering problem.	Satisfaction > 80%
	Option depth of EE	Understand the proper use of the work of others and issues such as plagiarism, copyrights, and patents.	Satisfaction > 80%
		Able to identify the ethical issues faced on the solution of an engineering problem.	Satisfaction > 80%
Aware and can interpret the IEEE Code of Ethics.		Satisfaction > 80%	
G	Language oral and written communications	Able to write effectively and be understood by technical and non-technical audiences.	Satisfaction > 80%
		Able to summarize their own work and the work of others.	Satisfaction > 80%
	Humanities and social sciences	Able to summarize their own work and the work of others.	Satisfaction > 80%
	Mathematics	Able to communicate graphically where appropriate.	Satisfaction > 80%
	Physical sciences	Able to communicate graphically where appropriate.	Satisfaction > 80%
	Fundamental knowledge of engineering sciences	Able to communicate graphically where appropriate.	Satisfaction > 80%
	Fundamental knowledge of EE	Able to communicate graphically where appropriate.	Satisfaction > 80%
	Core breadth of EE	Able to summarize their own work and the work of others.	Satisfaction > 80%
		Able to communicate graphically where appropriate.	Satisfaction > 80%
	Option depth of EE	Able to write effectively and be understood by technical and non-technical audiences.	Satisfaction > 80%
		Able to perform effective oral presentations and be understood by technical and non-technical audiences.	Satisfaction > 80%
		Able to summarize their own work and the work of others.	Satisfaction > 80%
Able to communicate graphically where appropriate.		Satisfaction > 80%	
H	Humanities and social sciences	Understand the impact of engineering solutions in a global and societal context.	Satisfaction > 80%
	Physical sciences	Aware of the long term implications of engineering solutions on the quality of life and the environment.	Satisfaction > 80%
	Fundamental knowledge of engineering sciences	Aware of the long term implications of engineering solutions on the quality of life and the environment.	Satisfaction > 80%
I	Electives	Capable of independent learning and in the search for information.	Satisfaction > 80%
	Core breadth of EE	Capable of using information searching tools and resources necessary to be up to date in their discipline.	Satisfaction > 80%
	Option depth of EE	Capable of using information searching tools and resources necessary to be up to date in their discipline.	Satisfaction > 80%
J	Humanities and social sciences	Aware of current professional and societal issues.	Satisfaction > 80%
		Able to differentiate between facts, beliefs, and opinions.	Satisfaction > 80%
	Core breadth of EE	Aware of emerging technologies and their impact in the future development of their field of study.	Satisfaction > 80%
		Aware of current professional and societal issues.	Satisfaction > 80%
	Option depth of EE	Able to differentiate between facts, beliefs, and opinions.	Satisfaction > 80%
		Aware of emerging technologies and their impact in the future development of their field of study.	Satisfaction > 80%
		Aware of current professional and societal issues.	Satisfaction > 80%
		Able to differentiate between facts, beliefs, and opinions.	Satisfaction > 80%

Recruiters Survey			
#	Component	Observation	Expectation
K	Core breadth of EE	Able to use computers to solve engineering problems and to evaluate solutions.	Satisfaction > 80%
		Aware of current techniques and tools used in electrical engineering practice.	Satisfaction > 80%
	Option depth of EE	Able to use computers to solve engineering problems and to evaluate solutions.	Satisfaction > 80%
		Aware of current techniques and tools used in electrical engineering practice.	Satisfaction > 80%

Table 34. Measurement expectations for the FE Examination Analysis: Objectives

FE Examination Analysis			
#	Component	Observation	Expectation
2	Mathematics	Thorough knowledge of math, science, and engineering fundamentals.	EE seniors score > US
	Physical sciences	Thorough knowledge of math, science, and engineering fundamentals. Physical thinking, approximation and simplification.	EE seniors Chemistry score > US.
	Fundamental knowledge of engineering sciences	Thorough knowledge of math, science, and engineering fundamentals. Physical thinking, approximation and simplification.	EE seniors passing rate > US
	Fundamental knowledge of EE	Thorough knowledge of basic electrical and computer engineering fundamentals and concepts. Physical thinking, approximation and simplification.	EE seniors passing rate > US average
	Core breadth of EE	Basic engineering design skills and in-depth knowledge of at least one EE area: (electronics, control, communications, and power systems). Physical thinking, approximation and simplification.	EE seniors passing rate > US
3	Mathematics	Develop ability to interpret graphical, numerical, and textual data; communicate technical information in oral, written, and graphical forms, in English and Spanish.	EE seniors score > US average.
	Physical sciences	Develop ability to interpret graphical, numerical, and textual data; communicate technical information in oral, written, and graphical forms, in English and Spanish; organize information.	EE seniors average Chemistry score > US.
	Fundamental knowledge of engineering sciences	Develop ability to interpret graphical, numerical, and textual data; communicate technical information in oral, written, and graphical forms, in English and Spanish; organize information.	EE seniors score > US in most subjects..
	Fundamental knowledge of EE	Develop ability to interpret graphical, numerical, and textual data; communicate technical information in oral, written, and graphical forms, in English and Spanish; organize information.	EE seniors passing rate > US
	Core breadth of EE	Develop ability to interpret graphical, numerical, and textual data; communicate technical information in oral, written, and graphical forms, in English and Spanish; organize information.	EE seniors passing rate > US
5	Humanities and social sciences	Develop ability to distinguish between ideas, opinions, beliefs, and facts; understand one's own cultural traditions in a broader context; consciousness of the ethical and societal aspects of their profession.	EE seniors score for Ethics > US
	Core breadth of EE	Develop ability to distinguish between ideas, opinions, beliefs, and facts; consciousness of the ethical and societal aspects of their profession.	EE seniors score for Ethics > US
	Option depth of EE	Develop ability to distinguish between ideas, opinions, beliefs, and facts; consciousness of the ethical and societal aspects of their profession.	EE seniors score for Ethics > US

Table 35. Measurement expectations for the FE Examination Analysis: Outcomes

FE Examination Analysis			
#	Component	Observation	Expectation
A	Mathematics	Able to apply math, science, and engineering knowledge to electrical engineering problems.	Seniors score > US
	Physical sciences	Possess sufficient knowledge of the basic physical and engineering sciences that will enable them to understand the physical operation of electrical and electronic devices and systems.	EE seniors Chemistry score > US.
	Fundamental knowledge of engineering sciences	Possess sufficient knowledge of the basic physical and engineering sciences that will enable them to understand the physical operation of electrical and electronic devices and systems.	Seniors score > US in most subjects

FE Examination Analysis			
#	Component	Observation	Expectation
	Fundamental knowledge of EE	Possess sufficient knowledge of the basic physical and engineering sciences that will enable them to understand the physical operation of electrical and electronic devices and systems.	EE seniors passing rate > US
	Core breadth of EE	Possess sufficient knowledge of the basic physical and engineering sciences that will enable them to understand the physical operation of electrical and electronic devices and systems.	EE seniors passing rate > US
B	Mathematics	Able to graphically and verbally represent or describe experimental data sets.	Seniors score > US
	Physical sciences	Able to graphically and verbally represent or describe experimental data sets.	EE seniors Chemistry score > US.
		Able to analyze, interpret, and draw conclusions based on experimental data.	Seniors passing rate > US
C	Core breadth of EE	Competent in determining design specifications and the scope of the project.	Seniors passing rate > US
		Able to determine the standard or criteria against which the outcome of the design process will be measured or compared.	Seniors passing rate > US
		Competent in documenting design procedures.	Seniors passing rate > US
		Able to follow logical and orderly design procedures, choosing the best solution for a given set of criteria.	Seniors passing rate > US
	Option depth of EE	Competent in determining design specifications and the scope of the project.	Seniors passing rate > US
		Able to determine the standard or criteria against which the outcome of the design process will be measured or compared.	Seniors passing rate > US
		Competent in documenting design procedures.	Seniors passing rate > US
		Able to follow logical and orderly design procedures, choosing the best solution for a given set of criteria.	Seniors passing rate > US
E	Mathematics	Capable of recognizing and understanding problem specifications, physical, and ethical constraints.	Seniors passing rate > US
	Physical sciences	Capable of recognizing and understanding problem specifications, physical, and ethical constraints.	EE seniors Chemistry score > US.
	Fundamental knowledge of engineering sciences	Capable of recognizing that they are facing an engineering problem.	Seniors score > US in most subjects
		Capable of recognizing and understanding problem specifications, physical, and ethical constraints.	Seniors score > US
	Fundamental knowledge of EE	Capable of recognizing and understanding problem specifications, physical, and ethical constraints.	Seniors passing rate > US
		Capable of physical thinking, approximation and simplification.	Seniors passing rate > US
		Capable of effectively describe a problem in a way that can lead to the construction of the solution.	Seniors passing rate > US
		Capable of defining a possible solution.	Seniors passing rate > US
		Able to determine the reasonableness of a solution within the physical and ethical context of the problem.	Seniors passing rate > US
	Core breadth of EE	Capable of recognizing that they are facing an engineering problem.	Seniors passing rate > US
		Capable of recognizing and understanding problem specifications, physical, and ethical constraints.	Seniors passing rate > US
		Capable of physical thinking, approximation and simplification.	Seniors passing rate > US
Capable of effectively describe a problem in a way that can lead to the construction of the solution.		Seniors passing rate > US average	
Capable of defining a possible solution.		Seniors passing rate > US	
	Able to determine the reasonableness of a solution within the physical and ethical context of the problem.	Seniors passing rate > US	
F	Humanities and social sciences	Able to identify the ethical issues faced on the solution of an engineering problem.	Seniors Ethics score > US
	Fundamental knowledge of engineering sciences	Able to identify the ethical issues faced on the solution of an engineering problem.	Seniors Ethics score > US
	Fundamental knowledge of EE	Able to identify the ethical issues faced on the solution of an engineering problem.	Seniors Ethics score > US
	Core breadth of EE	Able to identify the ethical issues faced on the solution of an engineering problem.	Seniors Ethics score > US

FE Examination Analysis			
#	Component	Observation	Expectation
	Option depth of EE	Understand the proper use of the work of others and issues such as plagiarism, copyrights, and patents.	Seniors Ethics score > US
		Able to identify the ethical issues faced on the solution of an engineering problem.	Seniors Ethics score > US
		Aware and can interpret the IEEE Code of Ethics.	Seniors Ethics score > US
K	Core breadth of EE	Able to use computers to solve engineering problems and to evaluate solutions.	Seniors computer score > US
		Aware of current techniques and tools used in electrical engineering practice.	Seniors passing rate > US

6 Assessment Timetable

The assessment process calls for the regular administration of the various assessment instruments. Over the long term, the data will provide the baseline against which the effectiveness of the program changes will be gauged. The following table provides the proposed timetable.

Table 36. Assessment timetable

Assessment Instruments	Consists of:	Administration frequency
Student transcripts analysis	Analysis of transcripts of students who completed the degree requirements	At the end of the academic year (during the summer period)
Survey of senior students	Survey administered to seniors enrolled in the capstone design course of the EE option.	Each academic term where senior design course is offered.
Alumni survey	Survey administered to alumni after 1 and 2 years of graduation.	Every two years during the month of February.
Recruiters survey	Survey administered to on campus recruiters and industrial supervisors of coop and intern students.	Every two years, as recruiters visit the campus
NCEES FE Examination	Report on the sub scores of the FE exam taken by our seniors and alumni.	Yearly, upon receipt of the report from the PR board.

This timetable may be modified as more experience is gained with the process and the variability of the data.

7 Conclusion

The assessment process presented in this document constitutes the basis for a continuous program review. As the department faculty becomes more experienced with assessment, this plan must be reviewed to assure that it remains an effective tool.