

Assessment Plan
Department of Electrical and Computer Engineering
Montana State University
Fall 2006

- **Major**
 - Undergraduate majors offered by the Electrical and Computer Engineering Department:
 - Bachelor of Science in Electrical Engineering
 - Bachelor of Science in Computer Engineering

- **Name, phone, and e-mail of primary assessment contact**

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- **Assessment Management Structure**

This section describes the components of processes that are designed to ensure that program outcomes are met, and that provide for periodic evaluations that could lead to continuing program improvements. The assessment processes are conducted by faculty using data and input from students, employers, and alumni of the programs.

(a) Design the Curriculum

The curriculum is designed to support the Program Outcomes with curriculum design change decisions scheduled at three-year intervals. Curriculum changes may be made based on feedback from constituents, changes in resources available to the program, or changes in faculty interests and expertise.

(b) Design the Courses

The design of courses, and course content, are reviewed yearly to ensure they are meeting Program Outcomes and Educational Objectives. The course design phase is a multi-step process where each faculty member responsible for a particular course selects course outcomes describing what the student is expected to be able to do at the conclusion of the course. A faculty review of course outcomes, particularly for sequences of courses where one may be a prerequisite for another, fosters a more tightly integrated and a well-managed curriculum. At the conclusion of the course, the faculty member assesses how well the stated course outcomes have been achieved and then, after analysis, feeds this information back to modify, if necessary, succeeding course outcomes statements.

(c) Assess Achievement of Program Outcomes

Each year the outcomes are assessed using component scores from selected classes with strong correlations to specific outcomes. Students' achievement is assessed using various tools, including performance on a national test (the Fundamentals of Engineering examination) and through components of the student design projects required of every engineering student to determine their success in achieving the Program Outcomes.

(d) Analyze Outcomes Assessment

Program outcomes are correlated with course outcomes assessed by each faculty member for individual courses. Yearly review of these course outcomes by departmental faculty allows course modifications to occur which affect program outcomes. More comprehensive program outcomes assessment occurs less frequently when alumni and employers are surveyed.

(e) Analyze Courses

Each faculty member is responsible for reviewing the student assessment analysis prior to teaching each course. Both program outcomes and course outcomes analyses are reviewed. Faculty members make changes in courses based on these analyses and on other information gained from other sources such as professional development activities. If changes are made to course outcomes, they are evaluated against program outcomes. These changes are documented and preserved in *ECE Department Course Notebooks* (one for each course taught). These notebooks contain a record of how a course was taught, what material was covered, handouts, and exams. These are then available for any subsequent instructor for the course to help in maintaining consistency from one year to the next.

(f) Analyze Curriculum

The curriculum for the Electrical Engineering and Computer Engineering programs are reviewed at three-year intervals when the Educational Objectives are reviewed. This loop allows us to redesign the curriculum if necessary. Major changes can be accomplished if Objectives change. Minor changes can be done also, such as adding a course or changing a course description, to enhance the achievement of program outcomes.

- **Degree Objectives**

The degree programs in the Electrical and Computer Engineering Department are designed to accomplish the following Program Objectives.

ECE Department Educational Objectives (What graduates are expected to accomplish during the first five years after graduation.)	
1.	Produce Computer Engineering graduates who pursue professional careers based on an education in the fundamentals of Electrical and Computer Engineering.
2.	Produce Electrical Engineering graduates who pursue professional careers based on an education in the fundamentals of Electrical and Computer Engineering.
3.	Produce graduates who are prepared to engage in advanced or additional education in their chosen field of endeavor or interest.
4.	Produce graduates who are recruited by a broad range of engineering employers.

- **Expected Competencies—major specific**

Competencies that students can expect from the ECE programs are identified as Program Outcomes. These are what students will achieve by the time of graduation.

ECE Department Program Outcomes – Electrical and Computer Engineering Programs	
The Electrical and Computer Engineering degree programs will demonstrate that their graduates have:	
a.	An ability to apply knowledge of mathematics, science, and engineering.
b.	An ability to design and conduct experiments, as well as to analyze and interpret data.
c.	An ability to design a system, component, or process to meet desired needs.
d.	An ability to function on multi-disciplinary teams.
e.	An ability to identify, formulate, and solve engineering problems.
f.	An understanding of professional and ethical responsibility.
g.	An ability to communicate effectively.
h.	The broad education necessary to understand the impact of engineering solutions in a global and societal context.
i.	A recognition of the need for, and an ability to engage in lifelong learning.
j.	A knowledge of contemporary issues.
k.	An ability to use the techniques, skills and modern engineering tools necessary for engineering practice.
l.	Knowledge of the principles of project management and design trade-offs.
Computer Engineering Specific Outcomes	
n.	An ability to program microcontroller/microcomputer systems using assembly and high-level languages.
o.	An ability to design digital systems using modern design tools.
p.	An ability to analyze electrical and electronic systems.
q.	An ability to implement real-time systems.
Electrical Engineering Specific Outcomes	
r.	An ability to analyze and synthesise electronic devices and electrical systems. <small>Error! Bookmark not defined.</small>

- **Additional Goals**

Students will be prepared either for entering the workforce in an engineering career, or to pursue a graduate degree in engineering or in the sciences. Past graduates of the programs have been very successful in both of these ventures.

- **Plan for Gathering and Summarizing Data**

This section briefly describes various assessment tools that are used, resulting in data that is employed to assess achievement of outcomes and objectives.

The two tables below show pre- and post-graduation devices, their general purpose, and when they are collected. The first table shows how the tools measure outcomes. Note that some of the tools described below also serve to evaluate objectives (as well as outcomes). Data is gathered using these tools.

ECE Programs - Pre-graduation Devices for Assessment		
Tool	General Use	When Collected
FE Exam	Document program performance in each category for each portion of the exam. Determine program strengths and weaknesses based on documented performance.	Each semester
College of Engineering Student Exit Survey	The student gives specific feedback on achievement of program outcomes.	Each semester
Transcript	Assess student demonstration of ability in program outcomes.	Each semester
Reviews of Senior Design Presentations	Assess outcomes related to design, communications, and social impact.	Annually
Student membership in IEEE	Assess outcomes related to professional and ethical responsibility.	Annually
Student Course Outcome Assessment	Assess each course relative to stated course outcomes.	Each semester

ECE Programs - Post-graduation Devices for Assessment		
Tool	General Use	When Collected
Industrial Advisory Council	Assess students' ethical responsibility, communication, knowledge of societal context, recognition of lifelong learning, and knowledge of contemporary issues.	Annually
Employer Survey	Evaluate graduates for objectives and outcomes.	At three year intervals
Alumni Survey	Evaluate graduates for objectives and post-graduation assessment of outcomes.	At three year intervals
Membership in professional society	Assess outcomes related to professional and ethical responsibility and life-long learning.	As part of alumni survey
Post-Graduate Education	Assess outcomes related to life-long learning.	As part of alumni survey

- **Plan for Utilizing Data**

The ECE faculty implements program improvement feedback processes in a number of ways, both formally and informally. This section describes these processes and summarizes some of the results and changes that have been made.

(1) Annual ECE Industrial Advisory Council Meeting

The annual ECE Industrial Advisory Council meeting is our prime venue to interact with our industrial constituents. Most discussions are related to the more global objectives but often we do consider outcomes, especially regarding the senior design project. The meetings provide numerous opportunities to review

and discuss program issues. Topics that appear regularly include discussions of Objectives, Outcomes, design projects, surveys, and faculty. We also review research projects and the graduate program.

(2) Annual Faculty Retreat

Each year, at the beginning of the Fall Semester, a departmental retreat is held at which departmental business is discussed. An appreciable time is spent on curriculum and programmatic issues. Agendas and meeting notes from recent faculty retreats is collected in the *ECE Program Improvement* binder.

ECE faculty retreats include information, discussion, and feedback on issues affecting the department. This daylong event helps to merge ideas and build a consensus among faculty, although not in every case. Even so, this event provides many opportunities to focus on program goals, such as Outcomes, Objectives, assessment tools, and program content. Examples of topics from recent meetings include the following:

- Scholarships
- Grants for lab equipment: computers, oscilloscopes, software
- Objectives and Outcomes
- Continuous improvement processes/plans/implementations
- Advising needs and improvements
- Curriculum planning
- Graduate programs

Considerable effort is involved with maintaining accreditation processes – reviewing, evaluating, identifying desired actions, and eventually implementing program improvement.

(3) Faculty Meetings

The Department holds general faculty meetings weekly during each semester. Information for faculty and faculty business relative to the smooth running of the department is conducted. Curricula and program improvements are regularly discussed. Meeting minutes were recorded starting in October 2002 to document these exchanges. An edited version of these notes (information not relevant to program feedback and improvement, such as social notices etc. has been removed) can be found in the *ECE Program Improvement* binder. This evidence demonstrates strong faculty involvement with assessment and accreditation processes.