Computer Engineering Assessment Plan
Missions and Outcomes

Three mission statements are provided below for the University of Cincinnati, the College of Engineering and Applied Science, and the School of Electronic and Computing Systems. Program educational objectives and student outcomes are outlined here as well.

1.1 University, College, and School Mission Statements

Mission for the University

The University of Cincinnati serves the people of Ohio, the nation, and the world as a premier, public, urban research university dedicated to undergraduate, graduate, and professional education, experience-based learning, and research. We are committed to excellence and diversity in our students, faculty, staff, and all of our activities. We provide an inclusive environment where innovation and freedom of intellectual inquiry flourish. Through scholarship, service, partnerships, and leadership, we create opportunity, develop educated and engaged citizens, enhance the economy and enrich our university, city, state and global community.1

Mission for the College

The mission of the College of Engineering and Applied Science2 is to provide:
1. Excellence in Education—provide a world-class education for our students
2. Excellence in knowledge creation and transfer in support of education and community—provide the best education featuring new breakthroughs in science and technology and be able to transfer that knowledge of science technology both to our students and to our local community
3. Accessibility—provide a venue where qualified students who want to come, can come; and provide the support necessary to allow them to be successful.

Mission for the School

The mission of the School of Electronic and Computing Systems3 is to provide:

• an enabling educational experience through connections to industry, strengths in entrepreneurship, and integration of theory and practice,
• the creation and transfer of knowledge in support of education and society, and
• an environment where a diverse community of qualified students receives the support necessary to succeed.

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3 SECS Strategic Plan, developed in Fall 2010.
Program Outcomes/Student Outcomes (P-1s)

As a college the programs have chosen to use the student outcomes required by the ABET Engineering Accreditation Commission (EAC) as the program outcomes or P-1s in the Curriculum to maintain one consistent assessment plan. The learning outcomes (P-1s) are:

(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 within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability,

(d) an ability to function on multidisciplinary 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, economic, environmental, and societal context,

(i) a recognition of the need for, and an ability to engage in life-long learning,

(j) a knowledge of contemporary issues, and

(k) an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.

Curriculum Program Maps

Computer Engineering Curriculum Mapping to Outcomes

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- **E = Emerging** – Students are first introduced to material related to an outcome. Mastery of the material is not expected. Assessment is limited to determination of ability to move forward in curriculum. Not all outcomes will have courses with “E” because introduction may occur in high school or A&S courses.
- **D = Developed** – New material builds on previous material. Mastery of basic material is expected. Students should show ability to handle more complex issues. Assessment is to determine ability of the student to move on in the curriculum and to assess effectiveness of earlier courses.
- **A = Achieved** – Students are expected to demonstrated proficiency. Assessment determines level of proficiency and effectiveness of earlier classes.
- Blank indicates not applicable.

- a) Students will have the ability to apply knowledge from mathematics, science, and engineering to design problems
- b) Students will have the ability to design and conduct experiments, as well as to analyze and interpret data
- c) Students will have the ability to design a system, component, or process to meet the desired needs
- d) Students will have the ability to function on multidisciplinary teams
- e) Students will have the ability to identify, formulate, and solve engineering problems
- f) Students will have an understanding of professional and ethical responsibility
- g) Students will have the ability to communicate effectively
- h) Students will have the broad education necessary to understand the impact of engineering solutions in a global and societal context
- i) Students will have a recognition of the need for, and an ability to engage in life-long learning
- j) Students will have a knowledge of contemporary issues
- k) Students will have the ability to use the techniques, skills, and modern engineering tools necessary for engineering practice

Items that need attention are in RED.

**EECE 1080C Programming for EECS (formerly SECS)**

**Course Learning Outcomes and Program Outcomes**

By the end of the course each student shall be able to:
1. Understand how to apply the engineering method to create a computer program (a, g).
2. Apply object-oriented design and coding using the C++ language to develop well-documented, modular C++ programs to solve engineering problems including embedded computing problems (a, c, e, g).
3. Employ array and list data structures in computer programs (e).
4. Implement simple algorithms and analyze their performance (e).
5. Perform software test planning and apply test methods and debugging techniques to assure correctness of computer programs (e).

EECE 2060C Digital Design

Course Learning Outcomes and Program Outcomes

By the end of the course each student shall be able to:

1. Analyze, design, and implement efficient combinational logic circuits (a, b, c, g)
2. Using a hardware description language, efficiently model and simulate reasonably complex combinational logic circuits (a, b, k)
3. Analyze, design, and implement sequential logic circuits (a, b, c, g)
4. Using a hardware description language, efficiently model and simulate reasonably complex sequential logic circuits (a, b, k)
5. Comprehend medium- and large-scale digital components (a)

Need to add f, h, i to course learning outcomes somewhere since we assess them in this course.

EECE 2070L Electronics Lab

Course Learning Outcomes and Program Outcomes

Students will:

1. be able to apply PSpice or other graphical computing tools to verify and plot circuit electrical characteristics (a, b, d, k)
2. understand operational amplifier operation (a, b)
3. comprehend and be able to construct and test field-effect and bipolar transistor amplifiers (a, b, c, d, k)
4. Comprehend and be able to construct and test multistage and differential feedback amplifiers. (a, b, c, d, k)
### EECE 3071 Electronics II

**Course Learning Outcomes and Program Outcomes**

Students will:
1. Comprehend feedback amplifier operation, including four basic feedback amplifier configurations, gain at low and high frequencies, and capacitance effects (add a-k outcomes after each learning outcome)
2. Comprehend and be able to analyze single-stage and multi-stage transistor amplifier operation, including amplifier stability, gain and phase margin, and pole mixing, and be able to construct Bode plots of the magnitude and phase of the gain
3. Comprehend and be able to analyze active filters, tuned amplifiers, and oscillators, including the use of operational amplifiers, reactive components, and positive feedback
4. Comprehend and be able to analyze digital bipolar circuits, digital inverters, and digital MOSFET circuits including NMOS and CMOS digital inverters
5. Complete a design for an analog or digital multistage circuit based on output/input specifications, including frequency response (switching speed), gain (noise margin), and system complexity, demonstrating competence in P-Spice and MATLAB.

Need to add a, c, e to course learning outcomes somewhere since we assess them in this course. Also k is listed on the syllabus.

### EECE 3071L Electronics II Lab

**Course Learning Outcomes and Program Outcomes**

Students will:
1. Comprehend and be able to design and test multi-stage, tuned, large signal, and power amplifiers (a, b, c, d, k)
2. Comprehend and be able to design and test emitter-coupled oscillators (a, b, c, d, k)
3. Comprehend and be able to design and test active filters (a, b, c, d, k)
4. Comprehend and be able to design transistor-transistor and emitter coupled logic circuits (a, c, d, k)

### EECE 3093C Software Engineering

**Course Learning Outcomes and Program Outcomes**

Students will:
1. Comprehend the software development and support process, project planning and organization, for both traditional and distributed projects (a, g)
2. Understand how to develop specifications, design, and tested-code for a set of software requirements (a, e)
3. Comprehend formal software engineering methods (a, e)
4. Apply principles of the ACM/IEEE Software Engineering Code of Ethics to class work (f)

Need to add d, j to course learning outcomes somewhere since we assess them in this course.
**EECE 4038C Embedded Systems Design**

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<th>Course Learning Outcomes and Program Outcomes</th>
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<td>Students will:</td>
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<tr>
<td>1. Identify applications that are appropriate for implementation using microcontrollers (a, c, e).</td>
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<td>2. Identify the major architectural components of a PIC microcontroller and understand their purpose (a, k).</td>
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<tr>
<td>3. Demonstrate (through oral presentation) using a commonly available CAD environment the ability to write, debug, and test assembly language programs for the PIC microprocessor family (a, c, e, g, k).</td>
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<tr>
<td>4. Design, verify and document an embedded system based solution to a general problem statement that utilizes common architectural features of the PIC microcontroller (may include digital/analog inputs, digital outputs, counter/timers, and interrupt driven program flow) (a, b, c, e, g, k).</td>
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Need to add f, h, i to course learning outcomes somewhere since we assess them in this course.

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**EECE 4040 Advanced Data Structures/Algorithms**

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<tr>
<td>Students will:</td>
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<tr>
<td>1. analyze, select, adapt, and create new abstract data types (ADTs) for solving problems. (add a-k outcomes after each learning outcome)</td>
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<td>2. perform algorithm analysis for both space and time complexity.</td>
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<td>3. comprehend and apply algorithms for sorting, searching, string matching, max/min problems, graphs, and hashing.</td>
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<tr>
<td>4. comprehend the concept of computational complexity and know an example of a heuristic algorithm for a computationally hard problem</td>
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Need to add a, c, e to course learning outcomes somewhere since we assess them in this course.
### EECE 5031 Senior Design I

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<th>Course Learning Outcomes and Program Outcomes</th>
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<tbody>
<tr>
<td>1. Students will comprehend a problem in their discipline. (a, e, g)</td>
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<tr>
<td>a. explain the background and motivation for the problem in their own words (h)</td>
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<td>b. define goal(s) to be achieved by the project implementation</td>
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<td>2. Students will analyze the problem. (a, c, e, g, k)</td>
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<td>a. determine the components of the problem</td>
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<tr>
<td>b. develop an approach to solving the problem</td>
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<td>c. specify the activities and resources needed to solve the problem</td>
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<td>3. Students will apply effective team management practices. (d)</td>
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<tr>
<td>4. Students will apply effective project management practices. (i)</td>
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<tr>
<td>5. Students will evaluate their professional and academic experiences together with capstone course requirements and articulate their reflections through both oral and written communication. (f, g, i)</td>
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*Need to add h to course learning outcomes in the official syllabus (added it here already). This syllabus needs to be updated to match how Fred Beyette has revised the course in the last two years.*

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### EECE 5032 Senior Design II

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<th>Course Learning Outcomes and Program Outcomes</th>
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<tr>
<td>1. Students will continue problem solving with their project teams to conduct project development. (a, c, d, e, g, k)</td>
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<td>2. Students will demonstrate an understanding of standards and realistic constraints applicable to their project. (c, f)</td>
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<td>3. Students will connect their project and discipline to broader impact on the world through reading, writing about, and discussing related current news events. (f, h, i, j)</td>
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<td>4. Students will complete projects and conduct a professional presentation and demonstration. (a, c, d, f, g, k)</td>
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<td>5. Students will reflect on their achievements and accomplishments over the course of the project development and summarize results in a final report. (f, g, i)</td>
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*This syllabus needs to be updated to match how Fred Beyette has revised the course in the last two years.*

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### IV. Methods and Measures

### V. Assessment Infrastructure

### VI. Findings

### VII. Use of Findings
1.2 Program Educational Objectives

In the first few years after graduation, alumni of our Computer Engineering programs will

- apply Computer Engineering practices, techniques, and tools to solve challenging problems relevant to societal and economic needs,

- demonstrate intellectual growth through continuing education and professional development, and

- provide technological and professional leadership in industrial and academic environments.