**Electrical and Computer Engineering Department**

**Annual Report on Assessment**

**B.S. in Electrical Engineering (EE) Program**

**B.S. in Computer Engineering (CompE) Program**

**2016-2017 Academic Year**

The academic year 2016-2017 is the 5th year of the six-year full assessment cycle for the EE and CompE programs. The 2012 Accreditation Board of Engineering and Technology (ABET) visit resulted in a commendation to the Electrical and Computer Engineering (ECE) department. The accreditation criterion changes effective 2013-2014 resulted in changes to the Student Outcomes Assessment Plans (SOAP) for each program. This process started in spring ’13 and rubrics were altered. The ECE department is currently using the updated rubrics for SLO evaluation.

The following is a summary of the most recent assessment activities for both programs.

**Student Learning Outcome (SLO) Website**

The ECE department decided to use online web space for storing data of SLO rather than physical course binders. We created a special section for assessment activity in the blackboard. While binders reflecting the ABET SLOs a-k had been created and were located in the common ECE faculty workroom in the past, the same assessment result as well as the student materials like homework and exams are uploaded in the blackboard. The assessment coordinator has populated the blackboard with rubrics of the embedded questions for all SLOs.

These online data are available for instructors to review and discuss as they continue to monitor SLOs throughout the six-year assessment cycle.

**Embedded Question Assessment Plan**

All student learning outcomes have been evaluated multiple times during each assessment period. The ECE faculty developed a structured plan during the 2016-2017 academic year with regards to embedded question. The plan ensures that all SLOs are evaluated at the same frequency during the six year assessment period. Additionally, the plan specifies the semesters in which instructors will be responsible for evaluating their course SLOs. It is the intention that by spreading out the assessment of SLOs in a pre-planned manner, one instructor will not be overwhelmed by SLO evaluation during one semester.

The characteristics of the plan are that every SLO is evaluated by embedded questions on a repeating four semester cycle. Approximately five courses are assessed for their SLOs using embedded questions per semester. This schedule ensures that all SLOs will be assessed minimum two times in a six year assessment period. A table including all courses in the ECE roadmap outlines the semesters in which they will be utilizing embedded questions as an SLO assessment tool. The table is in the SOAP.

1. **What learning outcomes did you assess?**

All ECE SLO’s were evaluated in AY2016-2017 for the preparation of ABET self-study report. A variety of assessment techniques were utilized. The SLOs for the Electrical and Computer Engineering Programs are the same as the ABET Student Learning Outcomes. They are as follows.

Graduates of the Electrical/Computer Engineering program are expected to achieve the following student learning outcomes.

1. "an ability to apply knowledge of mathematics, science, and engineering"
2. "an ability to design and conduct experiments, as well as to analyze and interpret data"
3. "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"
4. "an ability to function on multi-disciplinary teams"
5. "an ability to identify, formulate, and solve engineering problems"
6. "an understanding of professional and ethical responsibility"
7. "an ability to communicate effectively"
8. "the broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context"
9. "a recognition of the need for, and an ability to engage in life-long learning"
10. "a knowledge of contemporary issues"
11. "an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice"
12. **Instruments used and data received? (\* is to signify direct assessment)**

It must be noted that the published SOAPs for the EE and CompE programs include conducting an employer survey and alumni survey. The department has decided not to attempt this surveys any more due to the difficulty of collecting inputs from industry and alumni. Liability issues and confidentiality constraints have always made this survey hard to complete. This fact has been recognized by the ABET such that this particular assessment tool is not required any more. An informal way is now followed through the Industry Advisory Board Meeting where verbal input is given rather than completing a survey form.

1. **Exit Surveys**

Exit surveys captured information from all SLOs. Surveys were conducted in May 2017; nine graduating seniors completed the survey. A compilation of the data is included in the following bar charts.

*a b c d e f g h i j k*

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| SLO | *A* | *b* | *c* | *D* | *e* | *f* | *g* | *h* | *i* | *j* | *k* |
| Average | 4.22 | 4.22 | 4.11 | 4.55 | 4.33 | 4.23 | 4.22 | 4.11 | 4.44 | 3.77 | 4.33 |
| Std | 0.66 | 0.66 | 0.78 | 0.52 | 0.70 | 0.83 | 0.66 | 0.78 | 0.72 | 1.09 | 1.0 |

**Students’ comments:**

“The labs really bring all of the coursework together. I hope that as technology advances and new practices and industry standards emerge, so do the evolution of the courses in the ECE dept @ CSUFresno”

“The knowledge gained from the ECE department was very high quality. I enjoyed spending a lot of time in the ECE department.”

1. **Student-Faculty Forum**

In the annual student-faculty forum, a SLO survey was conducted as a follow-up of the discussions and identified issues; total 24 students, 12 EE and 12 CE students completed the survey. In the survey, students outcomes are break downed to four levels; none, deficiency, weakness, and concern. To quantify the result, we assigned scores to the four levels shown in the following table. Then, we provide a chart that provide a data summary.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| SLO Breakdowns | None | Deficiency | Weakness | Concern |
| Score | 5 | 4 | 3 | 2 |

*a b c d e f g h i j k*

The data shows that all SLOs meet the department’s standard of 3.75. Compared to last year’s data, all SLOs have improved. SLO-*b* is relatively low but it is still quite above the standard.

1. **Embedded Questions\***

Embedded questions were intensively used in multiple courses to assess relevant SLOs; according to the adopted SOAP for each program. All students in each course answered the questions in an exam or homework setting. Even though the SOAPs were revised to streamline this part of the assessment process covering the targeted SLOs on a two-year cycle, the department tries to obtain more data from each course. The assessment plan developed by the ECE faculty was followed for F’16 and S ’17. Based on SOAP, SLOs *a, c, d, e, g, k* for EE and CompE were assessed. The following table shows the AY16-17’s data as well as those of the past years for comparison purposes.

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| EE | a | c | d | e | g | k |
| AY13-15 | 3.86 | 4.78 | 3.00 | 2.68 | 3.77 | 4.95 |
| AY15-16 | 3.60 | 4.19 | 4.45 | 4.04 | 4.37 | 4.57 |
| AY16-17 | 3.76 | 3.93 | 3.81 | 3.84 | 4.27 | 4.38 |

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| CompE | a | c | d | e | g | k |
| AY13-15 | 2.9 | 2.67 | 3.43 | N/A | 3.88 | 4.92 |
| AY15-16 | 2.81 | 4.38 | 4.49 | 3.90 | 4.49 | 4.42 |
| AY16-17 | 3.93 | 3.81 | 4.61 | 4.69 | 3.42 | 3.91 |

For EE, the data shows that all SLOs met the 3.75 standard for the department. Even though the rating of SLO-*a* satisfies the department standard and it has been improved for years, but there is still room for improvement. To improve SLO-a, instructors might need to assign many practice problems to student and demonstrate the real-world problems that can be solved by applying knowledge in math, science and engineering.

For CompE, the data shows that all SLOs met the 3.75 standard except the SLO-g. The SLO-g has been above the department standard in the past but it shows a low rating in this year.

1. **Industry Advisory Council**

The ECE Industry Advisory Council meeting was held on May 9th, 2017. In the meeting, the current undergraduate program was reviewed and course updates and new course development were discussed. In addition, the progress of assessment activity has been posted and discussed.

1. **Faculty Focus Group**

A weekly faculty meeting is held in the ECE department and assessment is a recurring agenda item. In AY2016-2017 the embedded question assessment plan has been a topic of multiple faculty meetings. Additionally, compiled assessment data is presented to faculty during the weekly faculty meetings and discussed how the SLOs that are under the department’s standard can be improved. In addition, minor errors and typos in online information have been corrected to reflect the current SOAPs.

1. **Culminating Experience (Poster Session and Oral Presentations)\***

On 5/9/17, the electrical and computer engineering students presented their culminating experience projects at a technical poster session (LCOE Projects Day). Senior EE and CompE students form interdisciplinary teams to work on year-long design projects and they present their works together. Total 22 projects were presented in the project day. Five faculty members performed total 51 evaluations of projects and the summary of the data collected is as follows.

|  |  |  |
| --- | --- | --- |
| Oral and Written Communication  SLO g | Clarity | 4.50 |
| Eye Contact | 4.62 |
| Express Ideas | 4.56 |
| Answer Questions | 4.32 |
| Poster Quality | 4.05 |
| **Average** | **4.41** |
|  |  |  |
| Technical Content  SLO e & k | Methodology | 4.21 |
| Engineering Tools | 4.2 |
| Creativity | 3.64 |
| Argument | 3.94 |
| Conclusions | 3.49 |
| Accomplishments | 3.97 |
| Engineering Skills | 4.34 |
| **Average** | **3.97** |
|  |  |  |
| Overall | Excellent | 29.7% |
| Very Good | 34.0% |
| Good | 25.5% |
| Acceptable | 10.6% |
| Poor | 0% |

Most of subcategories of SLOs showed that they satisfied the department standard of 3.75. The overall scores are acceptable. However, there should be efforts to enhance to induce creativity of the project and to improve significance of conclusions. The creativity and the significance of conclusion are mainly related with the topic of the project. Instructors need to be more involved in the selection of project topic and to encourage/guide students to investigate and think deeply/diversely when they starts brain storming.

Overall quality of the culminating experience project rendered 89.4% of the projects to be good or above. None of the projects was considered poor.

1. **What did you discover from the findings?**

**EE Program:** Direct Assessment (Embedded Questions and Culminating Experience) indicated that all SLOs are met according to the department’s set standard. In the past, SLO-*a* (applying knowledge in math/science/engineering) showed the weakness and the need to be enhanced. In this year, it shows that SLO-a has been improved and it is above the department standard of 3.75.

Soft Assessment tools (Exit Survey, Student-Faculty Forum, Alumni Survey) show that all SLOs average ratings meet the department’s standard of 3.75 for EE. SLO-j (a knowledge of contemporary issues) in the exit survey is relatively low rating of 3.77.

Based on the direct and soft assessments, there is sufficient evidence that the SLOs of the EE program are met in all parts, but SLO-a and j needs continuous attention.

**CompE Program:** Direct Assessment (Embedded Questions and Culminating Experience) indicated that most SLOs are met according to the department’s set standard, except for SLO-g (an ability to communicate effectively). The direct assessment through embedded questions indicates that the SLO-g has the rating of 3.42. Interestingly, compared to the previous year, there is a significant improvement in SLOs-a and *e* for CompE while ratings of SLO-c and k are slightly decreased.

Soft Assessment tools (Exit Survey, Student-Faculty Forum, Alumni Survey) show that most SLOs average ratings that meet the department’s standard of 3.75 for CompE. However, SLO-j (a knowledge of contemporary issues) shows a relatively low rating in the exit survey.

There is sufficient evidence that the SLOs of the CompE program are met for the most parts, but SLO-g and *j* needs attention.

It should be noted that the CompE program has undergone a comprehensive review for several years and major changes were made to further strengthen the program and to keep it current with changes in technology.

1. **What changes did you make as a result of these findings?**

**EE Program:**

The faculty took a note of the need to emphasize how to deliver a knowledge of contemporary issues. In weekly faculty meetings, faculty members discussed how to effectively transfer knowledge on state-of-art technologies in class. It was suggested that faculty members encourage student to choose the class project that contains the current trend of technology. Providing supplementary materials through blackboard and open sessions for current techniques will be helpful. In addition, it was proposed that ECE103 and ECE186 are used to evaluate SLO-j. Instructors are asked to include components for the contemporary issue in syllabus. In addition, an assignment of writing on what kinds of state-of-art technologies are investigated and developed and how those technologies are changing our society and life can be given to students.

**CompE Program:**

Similar to EE program, assessment result showed that most of SLOs are satisfied, but SLO-g and j should be improved for CompE students. The changes suggested are same as those of EE as mentioned above for SLO-j. Especially, CompE faculty would take attention on providing more current trend of technology and such as implementation of as parallel processing, cloud computing, mobile platform and cyber securities, and internet of things (IoT). Actually, to address contemporary issue, the microcontroller platform has been upgraded. In ECE103, ECE174 and ECE178, more current trends in computer engineering will be address. Regarding SLO-g, more emphasis on the written and oral communication skills should be done in most of lab courses. Instructor might want to provide a good samples of report and to provide feedback to each lab report to improve the communication skills. In addition, ECE186A and ECE186B can be used to enhance the oral presentation skills.

The CompE program underwent a comprehensive program review by the faculty from two years ago. Courses were restructured and new topics were introduced. The main focus of the revisions was to further strengthen the curriculum and stay current with the advanced in the computer engineering technology.

1. **What assessment activities will you be conducting in the 2017-18 academic year?**

Based on the current SOAP, the ECE department will conduct the following assessment activity.

1. Exit Surveys
2. Embedded questions
3. Industry Advisory Council Meeting
4. Culminating Experience including Poster Sessions/Oral Presentations
5. Student-Faculty Forums
6. Faculty focus group
7. **What progress have you made on items from your program review action plan?**

ECE action plans were drafted and reviewed every year. Since then, every year the department made good progress towards each of the action items.

**Action 1**: The department shared the sample lab report that can be a good reference to students. Faculty need to put more attention on grading lab reports to improve students’ writing skills.

**Action 2**: To have a proper mix of faculty expertise, the department hired two new ECE faculty members since 2016 Fall with expertise in areas that expand and complement the existing expertise. New hire is undergoing in AY2018-2019 to hire two faculty members in EE and CompE, which will further help the department achieve its goal in this area.

**Action 3**: Lab development is continuing to take place every year according to the adopted strategic plan and more faculty development activities are being supported. Control lab and embedded system lab have been improved significantly through funding from the college.

**Action 4**: The learning outcomes assessment plan is under continued review to stay in alignment with changes in the national accrediting agency. The department is following the SOAP as closely as possible.

**Rubrics for EE**

# Math Science Engineering Rubric

**SLO a**

Course: ECE \_\_\_\_\_\_\_ Date: \_\_\_\_\_\_\_\_\_\_\_\_\_

Evaluate on a scale of 1-5 (5 is for excellent); check the proper box

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | 1 | 2 | 3 | 4 | 5 | N/A |
| Identification of Applicable Physics and Mathematics Principles | Lack of Knowledge |  |  |  | Complete Knowledge |  |
| Utilization of Physics and Mathematics Principles toward Modeling of an engineering system | Improper utilization or application |  |  |  | Proper and correct utilization |  |
| Application of the Mathematics Methodology toward analyzing an engineering system | Incorrect Application |  |  |  | Correct and Complete Application |  |
| Use of mathematical steps toward solving an engineering problem | Incorrect or invalid mathematical steps |  |  |  | Except for minor errors, completion of appropriate mathematical steps |  |
| Interpretation and appropriate presentation of results | Lack of Valid  results |  |  |  | Complete results that include proper units |  |

Overall average score \_\_\_\_\_\_\_\_\_\_

Evaluator \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Date \_\_\_\_\_\_\_\_\_\_\_\_\_

# Hands-on Experiment Rubric

**SLO b**

Course: ECE \_\_\_\_\_\_\_ Date: \_\_\_\_\_\_\_\_\_\_\_\_\_

Evaluate on a scale of 1-5 (5 is for excellent); check the proper box

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | 1 | 2 | 3 | 4 | 5 | N/A |
| Designing Experiments: Develop a methodology to test concepts and produce data to evaluate a specific process | Improper design or technique |  |  |  | Appropriate design or technique to evaluate a specific process |  |
| Conducting Experiments:  Operate appropriate laboratory equipment or hardware/software tools to collect data | Unable to operate equipment |  |  |  | Appropriate use of equipment |  |
| Interpreting Data:  Data manipulation and judgment | Improper data |  |  |  | Reasonable results |  |

Overall average score \_\_\_\_\_\_\_\_\_\_

Evaluator \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Date \_\_\_\_\_\_\_\_\_\_\_\_\_

# Design Rubric

**SLO c**

Course#: ECE \_\_\_\_\_\_\_\_\_\_ Date: \_\_\_\_\_\_\_\_\_\_\_\_\_

Evaluate on a scale of 1 – 5 (5 is for excellent); check the proper box

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | 1 | 2 | 3 | 4 | 5 |
| Design Statement  ( Problem explanation and identification of its constraints and specifications) | No clear objectives or identified needs | Unclear objective statement or not appropriate for the level of the activity | Clear objectives but no identified needs or constraints |  | Clear objectives and needs within realistic constraints including at least three of the following: economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability. |
| Design Process including alternative solutions | No evidence of ability  to understand  the design requirements,  limitations,  analyze different  alternatives, and  provide a feasible  design | Little evidence of  ability to understand  the design  requirements, limitations,  analyze  different alternatives,  and provide  a feasible design | Some evidence of  ability to understand  the design  requirements,  limitations, analyze  different alternatives,  and  provide a feasible  design |  | Clear evidence of  ability to understand  the design requirements, limitations, analyze  different alternatives,  and provide a feasible design |
| Application of appropriate mathematical models and engineering concepts in the design process | No evidence of ability  to identify and use engineering  principles in design | Identified appropriate concepts and demonstrated some effort to apply them | Some evidence of  ability to use engineering  principles  in design |  | Clear evidence of  ability to use mathematical models and/or engineering  principles  to design components, devices or systems |
| Final Product | Final design is lacking and the final product doesn’t meet expectations in format |  | Acceptable final product but needs better presentation format |  | Optimal / creative design in proper format |

Overall average score: \_\_\_\_\_\_\_\_\_

Evaluator: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Date: \_\_\_\_\_\_\_\_\_\_\_\_\_\_

# Teamwork Rubric

# SLO d

Course: ECE \_\_\_\_\_\_\_ Date: \_\_\_\_\_\_\_\_\_\_\_\_\_

Evaluate on a scale of 1-5 (5 is for excellent); check the proper box

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | 0 | 1 | 2 | 3 | 4 | 5 |
| ***Initiative*** | Doesn’t seem aware of responsibilities |  |  | Aware of responsibilities but does the absolute minimum |  | Engaging and brings new ideas to the table. |
| ***Responsiveness*** | Behind most of the time |  |  | Delivers on time but doesn’t seem to be engaging |  | Always on top of what is going on and delivers on time |
| ***Attitude*** | Rarely supports the efforts of others |  |  | Respects the views of others but not assertive in his views |  | Tries to make people work together and assertive in his actions |

Overall average score \_\_\_\_\_\_\_\_\_\_

Evaluator \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Date \_\_\_\_\_\_\_\_\_\_\_\_\_

# Formulate & Solve Engineering Problems Rubric

**SLO e**

Course#: ECE \_\_\_\_\_\_\_ Date: \_\_\_\_\_\_\_\_\_\_\_\_\_

Evaluate on a scale of 1-5 (5 is for excellent); check the proper box

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | 1 | 2 | 3 | 4 | 5 | N/A |
| Recognize class of problems | no recognition |  |  |  | Correct recognition |  |
| Formulate the problem using equations | No formulas or equations |  |  |  | Right formulas or equations |  |
| Solving equations and finding an answer | unsolved |  |  |  | Well solved |  |
| Analysis of the results | No analysis |  |  |  | Right analysis |  |

Overall average score \_\_\_\_\_\_\_\_\_\_

Evaluator \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Date \_\_\_\_\_\_\_\_\_\_\_\_\_

# Written Communication Rubric

**SLO g**

Course#: ECE \_\_\_\_\_\_\_ Date: \_\_\_\_\_\_\_\_\_\_\_\_\_

Evaluate on a scale of 1-5 (5 is for excellent); check the proper box

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | 1 | 2 | 3 | 4 | 5 | N/A |
| Spelling and grammar | many errors |  |  |  | minor or no errors |  |
| Focus and Organization | not organized and lacks clarity |  |  |  | well organized and clear |  |
| Sentence structure | poor structure |  |  |  | well structured |  |
| Use of references | not cited |  |  |  | cited properly |  |
| Transition between paragraphs | Ideas are not flowing smoothly |  |  |  | Document flows smoothly |  |

Overall average score \_\_\_\_\_\_\_\_\_\_

Evaluator \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Date \_\_\_\_\_\_\_\_\_\_\_\_\_

# Oral Communication Rubric

**SLO g**

Course #: ECE \_\_\_\_\_\_\_ Date: \_\_\_\_\_\_\_\_\_\_\_\_\_

Evaluate on a scale of 1-5 (5 is for excellent); check the proper box

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | 0 | 1 | 2 | 3 | 4 |  |
| ***Spoken communication***   1. ***Clarity*** 2. ***Formality*** | unclear pronunciation and lacking vocabulary |  |  | clear pronunciation but lacking vocabulary |  | clear pronunciation and appropriate vocabulary |
| ***Presentation***   1. ***Clarity of Voice*** 2. ***Eye Contact*** | Unclear voice and no eye contact |  |  | clear voice but no eye contact |  | proper level of voice and good eye contact |
| ***Ability to express ideas and answer questions*** | not able to express ideas or answer questions |  |  | Ideas expressed reasonably well but answers to questions is lacking |  | ideas expressed clearly and all questions are answered properly |
| ***Technical content***   1. ***Depth*** 2. ***Soundness*** | no depth and unclear approach |  |  | sufficient depth but unclear approach |  | appropriate depth and sound approaches |

Overall average score \_\_\_\_\_\_\_\_\_\_

Evaluator \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Date \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

# Breadth Rubric

**SLO h**

Course#: ECE \_\_\_\_\_\_\_ Date: \_\_\_\_\_\_\_\_\_\_\_\_\_

Evaluate on a scale of 1-5 (5 is for excellent); check the proper box

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | 1 | 2 | 3 | 4 | 5 | N/A |
| **Breadth**  Indicators:   * Referencing relevant information * Awareness of alternative solutions * Identification and application of pertinent engineering principles * Generalization of results and conclusions * Ability to verify validity of results * Understanding the impact of conclusions in a broader context | Inability to satisfactorily demonstrating at least one indicator |  | Satisfactory demonstration of at least three indicators |  | Strong demonstration of at least three indicators |  |
| **Overall score for breadth** | |  | | | | |
| **Depth**  Indicators:   * Ability to carry out detailed math and science analysis * Use of appropriate concepts and methods * Development of proper solution methodology * Ability to build on knowledge base of fundamental engineering principles * Integration of multiple knowledge areas to the solution of problems | Lacks in satisfactorily demonstrating at least one indicator |  | Satisfactory demonstration of at least three indicators |  | Strong demonstration of at least three indicators |  |
| **Overall score for depth** | |  | | | | |

Overall average score \_\_\_\_\_\_\_\_\_\_

Evaluator \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Date \_\_\_\_\_\_\_\_\_\_\_\_\_

# Modern Engineering Tools Rubric

**SLO k**

Course: ECE \_\_\_\_\_\_\_ Date: \_\_\_\_\_\_\_\_\_\_\_\_\_

Evaluate on a scale of 1-5 (5 is for excellent); check the proper box

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | 1 | 2 | 3 | 4 | 5 | N/A |
| Translation  (Translating statement to design) | Do not understand design statement |  |  |  | Finish design correctly |  |
| Choice of Right Tool  (Choosing tool for purpose) | Cannot choose tool for purpose |  |  |  | Choose the best available tool |  |
| Entry  (Using tool correctly to enter design) | Cannot use tool to enter design |  |  |  | Enter design correctly |  |
| Design Simulation  (Being able to run simulation) | Do not know how to run simulation |  |  |  | Generate correct simulation result |  |
| Verification  (Verifying the correctness of design) | Cannot interpret the simulation result to verify the correctness of design |  |  |  | Analyze the simulation result to verify |  |

Overall average score \_\_\_\_\_\_\_\_\_\_

Evaluator \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Date \_\_\_\_\_\_\_\_\_\_\_\_\_

**Rubrics for CE**

# Math Science Engineering Rubric

**SLO a**

Course: ECE \_\_\_\_\_\_\_ Date: \_\_\_\_\_\_\_\_\_\_\_\_\_

Evaluate on a scale of 1-5 (5 is for excellent); check the proper box

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | 1 | 2 | 3 | 4 | 5 | N/A |
| Identification of Applicable Physics and Mathematics Principles | Lack of Knowledge |  |  |  | Complete Knowledge |  |
| Utilization of Physics and Mathematics Principles toward Modeling of an engineering system | Improper utilization or application |  |  |  | Proper and correct utilization |  |
| Application of the Mathematics Methodology toward analyzing an engineering system | Incorrect Application |  |  |  | Correct and Complete Application |  |
| Use of mathematical steps toward solving an engineering problem | Incorrect or invalid mathematical steps |  |  |  | Except for minor errors, completion of appropriate mathematical steps |  |
| Interpretation and appropriate presentation of results | Lack of Valid  results |  |  |  | Complete results that include proper units |  |

Overall average score \_\_\_\_\_\_\_\_\_\_

Evaluator \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Date \_\_\_\_\_\_\_\_\_\_\_\_\_

# Hands-on Experiment Rubric

**SLO b**

Course: ECE \_\_\_\_\_\_\_ Date: \_\_\_\_\_\_\_\_\_\_\_\_\_

Evaluate on a scale of 1-5 (5 is for excellent); check the proper box

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | 1 | 2 | 3 | 4 | 5 | N/A |
| Designing Experiments: Develop a methodology to test concepts and produce data to evaluate a specific process | Improper design or technique |  |  |  | Appropriate design or technique to evaluate a specific process |  |
| Conducting Experiments:  Operate appropriate laboratory equipment or hardware/software tools to collect data | Unable to operate equipment |  |  |  | Appropriate use of equipment |  |
| Interpreting Data:  Data manipulation and judgment | Improper data |  |  |  | Reasonable results |  |

Overall average score \_\_\_\_\_\_\_\_\_\_

Evaluator \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Date \_\_\_\_\_\_\_\_\_\_\_\_\_

# Design Rubric

**SLO c**

Course#: ECE \_\_\_\_\_\_\_\_\_\_ Date: \_\_\_\_\_\_\_\_\_\_\_\_\_

Evaluate on a scale of 1 – 5 (5 is for excellent); check the proper box

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | 1 | 2 | 3 | 4 | 5 |
| Design Statement  ( Problem explanation and identification of its constraints and specifications) | No clear objectives or identified needs | Unclear objective statement or not appropriate for the level of the activity | Clear objectives but no identified needs or constraints |  | Clear objectives and needs within realistic constraints including at least three of the following: economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability. |
| Design Process including alternative solutions | No evidence of ability  to understand  the design requirements,  limitations,  analyze different  alternatives, and  provide a feasible  design | Little evidence of  ability to understand  the design  requirements, limitations,  analyze  different alternatives,  and provide  a feasible design | Some evidence of  ability to understand  the design  requirements,  limitations, analyze  different alternatives,  and  provide a feasible  design |  | Clear evidence of  ability to understand  the design requirements, limitations, analyze  different alternatives,  and provide a feasible design |
| Application of appropriate mathematical models and engineering concepts in the design process | No evidence of ability  to identify and use engineering  principles in design | Identified appropriate concepts and demonstrated some effort to apply them | Some evidence of  ability to use engineering  principles  in design |  | Clear evidence of  ability to use mathematical models and/or engineering  principles  to design components, devices or systems |
| Final Product | Final design is lacking and the final product doesn’t meet expectations in format |  | Acceptable final product but needs better presentation format |  | Optimal / creative design in proper format |

Overall average score: \_\_\_\_\_\_\_\_\_

Evaluator: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Date: \_\_\_\_\_\_\_\_\_\_\_\_\_\_

# Teamwork Rubric

# SLO d

Course: ECE \_\_\_\_\_\_\_ Date: \_\_\_\_\_\_\_\_\_\_\_\_\_

Evaluate on a scale of 1-5 (5 is for excellent); check the proper box

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | 0 | 1 | 2 | 3 | 4 | 5 |
| ***Initiative*** | Doesn’t seem aware of responsibilities |  |  | Aware of responsibilities but does the absolute minimum |  | Engaging and brings new ideas to the table. |
| ***Responsiveness*** | Behind most of the time |  |  | Delivers on time but doesn’t seem to be engaging |  | Always on top of what is going on and delivers on time |
| ***Attitude*** | Rarely supports the efforts of others |  |  | Respects the views of others but not assertive in his views |  | Tries to make people work together and assertive in his actions |

Overall average score \_\_\_\_\_\_\_\_\_\_

Evaluator \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Date \_\_\_\_\_\_\_\_\_\_\_\_\_

# Formulate & Solve Engineering Problems Rubric

**SLO e**

Course#: ECE \_\_\_\_\_\_\_ Date: \_\_\_\_\_\_\_\_\_\_\_\_\_

Evaluate on a scale of 1-5 (5 is for excellent); check the proper box

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | 1 | 2 | 3 | 4 | 5 | N/A |
| Recognize class of problems | no recognition |  |  |  | Correct recognition |  |
| Formulate the problem using equations | No formulas or equations |  |  |  | Right formulas or equations |  |
| Solving equations and finding an answer | unsolved |  |  |  | Well solved |  |
| Analysis of the results | No analysis |  |  |  | Right analysis |  |

Overall average score \_\_\_\_\_\_\_\_\_\_

Evaluator \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Date \_\_\_\_\_\_\_\_\_\_\_\_\_

# Written Communication Rubric

**SLO g**

Course#: ECE \_\_\_\_\_\_\_ Date: \_\_\_\_\_\_\_\_\_\_\_\_\_

Evaluate on a scale of 1-5 (5 is for excellent); check the proper box

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | 1 | 2 | 3 | 4 | 5 | N/A |
| Spelling and grammar | many errors |  |  |  | minor or no errors |  |
| Focus and Organization | not organized and lacks clarity |  |  |  | well organized and clear |  |
| Sentence structure | poor structure |  |  |  | well structured |  |
| Use of references | not cited |  |  |  | cited properly |  |
| Transition between paragraphs | Ideas are not flowing smoothly |  |  |  | Document flows smoothly |  |

Overall average score \_\_\_\_\_\_\_\_\_\_

Evaluator \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Date \_\_\_\_\_\_\_\_\_\_\_\_\_

# Oral Communication Rubric

**SLO g**

Course #: ECE \_\_\_\_\_\_\_ Date: \_\_\_\_\_\_\_\_\_\_\_\_\_

Evaluate on a scale of 1-5 (5 is for excellent); check the proper box

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | 0 | 1 | 2 | 3 | 4 |  |
| ***Spoken communication***   1. ***Clarity*** 2. ***Formality*** | unclear pronunciation and lacking vocabulary |  |  | clear pronunciation but lacking vocabulary |  | clear pronunciation and appropriate vocabulary |
| ***Presentation***   1. ***Clarity of Voice*** 2. ***Eye Contact*** | Unclear voice and no eye contact |  |  | clear voice but no eye contact |  | proper level of voice and good eye contact |
| ***Ability to express ideas and answer questions*** | not able to express ideas or answer questions |  |  | Ideas expressed reasonably well but answers to questions is lacking |  | ideas expressed clearly and all questions are answered properly |
| ***Technical content***   1. ***Depth*** 2. ***Soundness*** | no depth and unclear approach |  |  | sufficient depth but unclear approach |  | appropriate depth and sound approaches |

Overall average score \_\_\_\_\_\_\_\_\_\_

Evaluator \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Date \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

# Breadth Rubric

**SLO h**

Course#: ECE \_\_\_\_\_\_\_ Date: \_\_\_\_\_\_\_\_\_\_\_\_\_

Evaluate on a scale of 1-5 (5 is for excellent); check the proper box

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | 1 | 2 | 3 | 4 | 5 | N/A |
| **Breadth**  Indicators:   * Referencing relevant information * Awareness of alternative solutions * Identification and application of pertinent engineering principles * Generalization of results and conclusions * Ability to verify validity of results * Understanding the impact of conclusions in a broader context | Inability to satisfactorily demonstrating at least one indicator |  | Satisfactory demonstration of at least three indicators |  | Strong demonstration of at least three indicators |  |
| **Overall score for breadth** | |  | | | | |
| **Depth**  Indicators:   * Ability to carry out detailed math and science analysis * Use of appropriate concepts and methods * Development of proper solution methodology * Ability to build on knowledge base of fundamental engineering principles * Integration of multiple knowledge areas to the solution of problems | Lacks in satisfactorily demonstrating at least one indicator |  | Satisfactory demonstration of at least three indicators |  | Strong demonstration of at least three indicators |  |
| **Overall score for depth** | |  | | | | |

Overall average score \_\_\_\_\_\_\_\_\_\_

Evaluator \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Date \_\_\_\_\_\_\_\_\_\_\_\_\_

# Modern Engineering Tools Rubric

**SLO k**

Course: ECE \_\_\_\_\_\_\_ Date: \_\_\_\_\_\_\_\_\_\_\_\_\_

Evaluate on a scale of 1-5 (5 is for excellent); check the proper box

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | 1 | 2 | 3 | 4 | 5 | N/A |
| Translation  (Translating statement to design) | Do not understand design statement |  |  |  | Finish design correctly |  |
| Choice of Right Tool  (Choosing tool for purpose) | Cannot choose tool for purpose |  |  |  | Choose the best available tool |  |
| Entry  (Using tool correctly to enter design) | Cannot use tool to enter design |  |  |  | Enter design correctly |  |
| Design Simulation  (Being able to run simulation) | Do not know how to run simulation |  |  |  | Generate correct simulation result |  |
| Verification  (Verifying the correctness of design) | Cannot interpret the simulation result to verify the correctness of design |  |  |  | Analyze the simulation result to verify |  |

Overall average score \_\_\_\_\_\_\_\_\_\_

Evaluator \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Date \_\_\_\_\_\_\_\_\_\_\_\_\_

**DEPARTMENT OF ELECTRICAL AND COMPUTER ENGINEERING  
STUDENT-FACULTY FORUM**

**Program of Study:** *Computer Engineering \_\_\_\_ Electrical Engineering \_\_\_\_*

**Class Standing:**  *Freshman \_\_ Sophomore \_\_\_ Junior \_\_ Senior \_\_ Graduate \_\_\_*

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | **Concern** | **Weakness** | **Deficiency** | **None** | **Comment** |
| 1. an ability to apply knowledge of math, engineering, and science |  |  |  |  |  |
| 1. an ability to design and conduct experiments, as well as to analyze and interpret data |  |  |  |  |  |
| 1. an ability to design system, component or process to meet needs within realistic constraints |  |  |  |  |  |
| 1. an ability to function on multi-disciplinary teams |  |  |  |  |  |
| 1. an ability to identify, formulate, and solve engineering problems |  |  |  |  |  |
| 1. an understanding of professional and ethical responsibility |  |  |  |  |  |
| 1. an ability to communicate effectively |  |  |  |  |  |
| 1. the broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context |  |  |  |  |  |
| 1. a recognition of need for, and an ability to engage in life-long learning |  |  |  |  |  |
| 1. a knowledge of contemporary issues |  |  |  |  |  |
| 1. an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice |  |  |  |  |  |

**Please provide general comments/suggestions about the curriculum, the facilities, or any relevant matter affecting your academic progress:**

**ECE Department Exit Survey**

Major: Electrical Engr. \_\_\_\_ Computer Engr. \_\_\_\_\_

Have you accepted a job? Yes \_\_\_\_ No \_\_\_\_\_ , If yes, name of company or organization you will work:

Your permanent email address:\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**(5 being the highest and 1 being the lowest)**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
|  | **Electrical Engineering Senior Exit Questionnaire** | 5 | 4 | 3 | 2 | 1 | Comment |
| 1. | Overall quality of your engineering course work |  |  |  |  |  |  |
| 2. | Overall quality of your engineering laboratory course work |  |  |  |  |  |  |
| 3. | Overall quality of your general education course work (arts, humanities, and social science courses) taken outside of engineering. |  |  |  |  |  |  |
| 4. | Support, assistance and general help you received from the College of Engineering faculty at Fresno State |  |  |  |  |  |  |
| 5. | If you participated in the co-op program, please rate the overall quality of your experience: |  |  |  |  |  |  |
| a. | ***How do you feel about your preparation to (learned from the Fresno State) ;***  Apply knowledge of math, science and engineering |  |  |  |  |  |  |
| b. | Design and conduct experiments (hands-on experience) |  |  |  |  |  |  |
| c. | Design a system, component, process (design experience) |  |  |  |  |  |  |
| d. | Function in a team environment (team work) |  |  |  |  |  |  |
| e. | Apply math and computer tools for analysis and design |  |  |  |  |  |  |
| f. | Identify, formulate, and solve engineering problems (problem Solving skills) |  |  |  |  |  |  |
| g. | Communicate effectively (oral and in writing) |  |  |  |  |  |  |
| h. | Understand the impact of engineering solutions on global, economic, environmental and social issues (broad education) |  |  |  |  |  |  |
| i. | Recognize the need and engage in life-Long learning (self learning skills) |  |  |  |  |  |  |
| j. | Deal with contemporary issues (awareness of new technologies) |  |  |  |  |  |  |
| k. | Use engineering tools (software and hardware) |  |  |  |  |  |  |