Cleveland State University
Fenn College of Engineering

**Department of Electrical and Computer Engineering**
***Master of Science in Electrical Engineering (MSEE)***

# Assessment, Assessment Report, and Suggestions

*Academic Year 2009/2010*

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## I. Overview

The Department of Electrical and Computer Engineering (ECE) uses two assessment strategies for its MSEE program: an exit survey which is completed by graduating students, and a thesis defense questionnaire which is completed by faculty. Below is a list showing how many survey responses we received over the past few years.

- 2004/05: 47 student surveys and 59 faculty thesis surveys
- 2005/06: 39 student surveys and 45 faculty thesis surveys
- 2006/07: 5 student surveys and 19 faculty thesis surveys
- 2007/08: 24 student surveys and 28 faculty thesis surveys
- 2008/09: 10 student surveys and 10 faculty thesis surveys
- 2009/10: 5 student surveys and 16 faculty thesis surveys

In 2009/10 we had 26 graduates but collected only 5 student surveys. These numbers indicate that we need to enforce the collection of student surveys from our graduating students.

We supervised 6 Master's theses and received 16 faculty thesis surveys. Given that there are usually 3 faculty members per thesis, we collected 16 out of 18 possible faculty thesis surveys. Therefore, it seems that we are doing a good job of collecting faculty thesis surveys. Faculty are in the habit of completing thesis surveys.

In summer 2009 we received the following feedback from the Assessment Office.

(1) *"We strongly support your plan to involve program faculty in a discussion of the matrix of program goals, objectives, and outcomes."* We did not do this during the past year, but will make it a priority to do so this fall. The goal here is to focus the matrix so that the connections between program goals, objectives, and outcomes are more direct, and so that all matrix elements involve student learning outcomes.

(2) *"We fully support your proposal to collect assessment data from non-thesis students by using a project questionnaire."* This was proposed to the ECE Department's graduate program committee (GPC), but met with an unenthusiastic response. Due to the underwhelming response from the GPC, the issue was not raised with the faculty. However, we will pursue this during the coming academic year.

In last year's assessment report, we proposed the following action.

(1) *"Establish benchmark scores for acceptable performance for each outcome."* We did not do this last year because of other priorities, but we will make this a priority this year and discuss it with the faculty in fall 2010.

Additional actions are recommended in Section VI of this report.

**Recent Improvements**

In recent years we improved the MSEE program based on feedback from the assessment study. For example, we changed the program structure to include four specializations (control, communication, power, and computers) which were approved by the faculty in spring 2007. This is particularly useful for non-thesis students, who previously were not guided well in their plan of study.

The five-year Bachelor's/Master's Accelerated Program officially began in spring 2008. An information session for new MSEE students has been held every semester since spring 2007. An annual outstanding thesis/dissertation award was approved by the faculty in fall 2007 and the first award was given in spring 2008.

This past year we instituted a mandatory check for plagiarism in all Master's theses by the GPC. All degree completion forms for Master's students are now required to be signed by the GPC, and the GPC does not sign the form until results obtained from www.turnitin.com indicate that the thesis is free from plagiarism.

This past year we proposed the new degree program Master of Science in Computer Engineering (MSCE). This will be similar to our existing MSEE computer engineering track, but will allow students to receive a degree with a name that more accurately reflects their studies. The program development plan (PDP) has been approved at the university level and has received external comments from OBOR schools. We are now ready to write a full proposal. The MSCE will expand the services that we offer to our students and will help with the recruitment of new students.

This past year the MSEE Student Exit Survey was redesigned in order to eliminate confusion among students who answered the questions on the form. This was done based on recommendations from previous assessment reports.

We added a technical writing course to the curriculum (EEC 503). This is not required by the MSEE program, but many thesis advisors require their students to take the course, which improves their writing and presentation skills.

## II. Goals, Objectives, and Outcomes

**Program Goals**

The goal of the MSEE program is to provide students with an educational experience that helps them:

(1) Lead fulfilling and productive lives;
(2) Assume leading professional roles in industry;
(3) Improve their employment and/or career possibilities as engineers upon graduation;
(4) Continue their formal education in doctoral programs;
(5) Participate in lifelong learning.

**Program Objectives**

The objectives of MSEE program are to:

(1) Offer an MSEE curriculum that is a balance between theory and practice;
(2) Offer an MSEE curriculum that meets the current needs of industry;
(3) Obtain teaching and research assistantships for qualified students;
(4) Offer an MSEE curriculum that allows students to improve their employment possibilities after graduation;
(5) Offer an MSEE curriculum that allows students to enter doctoral programs after graduation;
(6) Secure an adequate budget for the department;
(7) Maintain an adequate level of student enrollment;
(8) Promote faculty research;
(9) Promote faculty teaching effectiveness;
(10) Recruit and retain qualified faculty.

**Outcomes**

The MSEE program is designed to help students acquire:

(a) A knowledge of advanced engineering analysis and design tools;
(b) The ability to use advanced engineering analysis and design tools to design practical systems;
(c) The ability to access and use the literature in one's field;
(d) The ability to communicate effectively.

The purpose of assessment is to measure how well we are achieving the four outcomes listed above. The following table shows how the program outcomes are linked to the goals and objectives. Not all goals and objectives are directly linked to student learning outcomes. We plan to modify the matrix in the near future so that is entirely focused on student learning outcomes.

| Goals and Objectives / Outcomes | | (a) Knowledge of advanced engineering analysis and design | (b) Ability to use advanced engineering analysis and design tools to design practical systems | (c) Ability to access and use the literature in one's field | (d) Ability to communicate effectively |
|---|---|---|---|---|---|
| **Goals** | 1. Lead fulfilling and productive lives. | | | | |
| | 2. Assume leading professional roles in industry. | | | | √ |
| | 3. Improve employment and/or career possibilities as engineers upon graduation | | | √ | |
| | 4. Continue formal education in doctoral programs. | √ | | | |
| | 5. Participate in lifelong learning. | | √ | | |
| **Objectives** | 1. Offer an MSEE curriculum that is a balance between theory and practice. | | √ | | |
| | 2. Offer an MSEE curriculum that meets the current needs of industry. | | √ | | |
| | 3. Obtain teaching and research assistantships for qualified students. | | | | |
| | 4. Offer an MSEE curriculum that allows students to improve their employment possibilities after graduation. | | √ | | √ |
| | 5. Offer an MSEE curriculum that allows students to enter doctoral programs after graduation. | √ | | | √ |
| | 6. Secure an adequate budget for the department. | | | | |
| | 7. Maintain an adequate level of student enrollment. | | | | |
| | 8. Promote faculty research. | √ | | | √ |
| | 9. Promote faculty teaching effectiveness. | √ | √ | √ | √ |
| | 10. Recruit and retain qualified faculty. | √ | | √ | |

## III. Student Academic Achievement Assessment Strategies

We agree with ABET EC2000 that assessment should be an on-going process that accomplishes the following:
(1) Starts with the definition of objectives and outcomes;
(2) Continues with annual assessment of the status of meeting the objectives and outcomes with all educational means, mainly the offering of courses;
(3) Concludes with the adjustment of educational practice, based on the assessment findings, to better meet the objectives and outcomes.

This process continues in a spiral manner in the sense that each iteration of the process is designed to result in a higher quality of education.

### III.1 Assessment Methods

In this year's assessment study, as in previous years, the MSEE Program used two assessment strategies.

- Exit survey, completed by students
- Thesis defense questionnaire, completed by faculty

**Assessment strategy #1: Student Exit Questionnaire**

Student exit questionnaires are distributed at the end of each semester. Each graduating MSEE student is asked to fill out a Student Exit Survey form (see below). The forms are distributed and collected by the department secretary. In Part I, the student is asked to answer six general questions about the quality of the academic program, the courses, and the faculty. In Part II, the student is asked to answer six questions regarding whether the desired outcomes of the curriculum were met. At the end of the questionnaire, the student is asked to comment on the strengths and weaknesses of the MSEE program, and on how the MSEE program could be improved. The student exit survey questions include the following.

**Part I:**

1. The MSEE program promotes excellence in teaching.
2. The MSEE program promotes excellence in research.
3. The MSEE program provides the best qualified faculty and promotes their development.
4. The MSEE program encourages the faculty to obtain research funds maintain state-of-the-art labs.
5. The MSEE program awards teaching assistantships to the most qualified students.
6. The MSEE program awards research assistantships to the most qualified students.

**Part II:**

1. The MSEE student developed a deeper understanding of the principles underlying a particular field of study.
2. The MSEE student developed a knowledge of advanced methods of analysis and synthesis that are more powerful and generally applicable than those taught at the undergraduate level.
3. The MSEE student developed the ability to independently read and understand classical and contemporary works that contribute to advancements in the chosen field.
4. The MSEE student developed insight into the significance, limitations, and relationships of available results and methods.
5. The MSEE student developed the capacity, imagination, and courage to contribute to the advancement of the electrical engineering field.
6. The MSEE student developed the ability to make quality written and oral presentations to technically literate audiences.

**Part III:** Comments on what you feel strongly about the program.

**Assessment strategy #2: Thesis Defense Questionnaire**

Each member of the student's thesis committee fills out a questionnaire immediately after the oral defense. The faculty rates the following qualities related to the student's thesis and presentation.

1. Knowledge of advanced engineering analysis and design tools.
2. The ability to use advanced engineering analysis and design tools to design practical systems.
3. The ability to access and use the literature in one's field.
4. The ability to communicate effectively.
    a. Quality of the writing style.
    b. Organization of the written these.
    c. Organization of the presentation.
    d. Clarity of language usage.
    e. Quality of slides.

### III.2 Outcome/Assessment Matrix

The assessment tools include a student exit survey and a thesis defense questionnaire. The outcomes and the assessment strategies for outcomes are summarized in the following table.

| Assessment Tools \ Outcomes | | (a) Knowledge of advanced engineering analysis and design tools | (b) Ability to use advanced engineering analysis and design tools to design practical systems | (c) Ability to access and use the literature in one's field | (d) Ability to communicate effectively |
|---|---|---|---|---|---|
| **Student Exit Survey (Part II)** | 1. The MSEE student developed a deeper understanding of the principles underlying a particular field of study, as well as those underlying other fields. | √ | | | |
| | 2. The MSEE student developed a knowledge of advanced methods of analysis and synthesis that are more powerful and more generally applicable than those taught at the undergraduate level. | √ | | | |
| | 3. The MSEE student developed the ability to independently read and understand classical and contemporary works that contribute to advancements in the chosen field. | | | √ | |
| | 4. The MSEE student developed an insight into the significance and the limitations of available results and methods, as well as their relationships to each other. | | √ | | |
| | 5. The MSEE student developed the capacity, imagination, and courage to contribute to the advancement of the electrical engineering field. | | √ | | |
| | 6. The MSEE student developed the ability to make quality written and oral presentations to technically literate audiences. | | | | √ |
| **Thesis Defense Questionnaire** | 1. Knowledge of advanced engineering analysis and design tools | √ | | | |
| | 2. The ability to use advanced engineering analysis and design tools to design practical systems | | √ | | |
| | 3. The ability to access and use the literature in one's field | | | √ | |
| | 4. The ability to communicate effectively | | | | √ |

## IV. Assessment of Outcomes

The following table presents a summary of the overall average scores of all outcomes. The overall average score is an average of scores obtained by various assessment tools during two semesters. Scores are percentages that are obtained by normalizing scores to their maximums. A score of 90 to 100 indicates excellent, 80 to 90 indicates very good, 70 to 80 indicates good, 60 to 70 indicates satisfactory, and less than 60 indicates unsatisfactory.

| **Outcome** | **Overall average score (percent)** | | | | | | |
|---|---|---|---|---|---|---|---|
| | **09-10** | **08-09** | **07-08** | **06-07** | **05-06** | **04-05** | **03-04** |
| (a) Knowledge of advanced engineering analysis and design tools | **94** | 78 | 72 | 79 | 79 | 80 | 86 |
| (b) Ability to use advanced engineering analysis and design tools to design practical systems | **94** | 77 | 76 | 73 | 79 | 80 | 87 |
| (c) Ability to access and use the literature in one's field | **88** | 81 | 76 | 73 | 78 | 74 | 82 |
| (d) Ability to communicate effectively | **100** | 81 | 78 | 76 | 79 | 83 | 87 |

The scores were noticeably better this year than in the past. In fact, all scores are at historic highs. However, only 5 students responded to the survey. It may be that the students who responded had a good experience with the program and were likely to answer the survey, while students who had a poor experience ignored the department's request for the survey. Whatever the reason, we are pleased with the results, but recognize that we need to obtain a more uniform sampling from students in future years. In the following we present detailed scores for each outcome.

**<u>Outcome (a):</u> Knowledge of advanced engineering analysis and design tools**

This outcome is to be realized by all EEC courses and is evaluated based on items 1 and 2 in part II of the exit survey, and item 1 of the thesis survey.

| Assessment strategy | Average overall score (percent) | | | | | | |
|---|---|---|---|---|---|---|---|
| | **09-10** | **08-09** | **07-08** | **06-07** | **05-06** | **04-05** | **03-04** |
| Exit questionnaire part II #1<br>The MSEE students developed a | | | | | | | |

**<u>Outcome (b):</u> Ability to use advanced engineering analysis and design tools to design practical systems**

This outcome is to be realized by all EEC courses and is evaluated based on items 4 and 5 in part II of the exit survey, and item 2 of the thesis survey.

| Assessment strategy | Average overall score (percent) | | | | | | |
|---|---|---|---|---|---|---|---|
| | **09-10** | **08-09** | **07-08** | **06-07** | **05-06** | **04-05** | **03-04** |
| Exit questionnaire part II #4<br>The MSEE students developed an insight into the significance and the limitations of available results and methods, as well as the relationships with each other. | **95** | 68 | 72 | 64 | 76 | 78 | 84 |
| Exit questionnaire part II #5<br>The MSEE students developed the capacity, imagination, and courage to contribute to the advancement of the electrical engineering field. | **92** | 66 | 68 | 68 | 77 | 81 | 90 |
| Thesis survey #2<br>The ability to use advanced engineering analysis and design tools to design practical systems | **80** | 96 | 89 | 92 | 84 | 81 | 87 |
| **Overall average** | **89** | **74** | **76** | **73** | **79** | **80** | **87** |

**Conclusions:**

The overall average score is 89, which is quite good, so this outcome has been met. Interestingly, the faculty opinions are lower than the students' opinions of themselves. This may simply reflect the fact that this year's Master's theses were less applied (more theoretical) than in previous years.

**<u>Outcome (c):</u> Ability to access and use the literature in one's field**

This outcome is to be realized by all EEC courses and is evaluated based on item 3 in part II of the exit survey and item 3 in the thesis survey.

| Assessment strategy | Average overall score (percent) | | | | | | |
|---|---|---|---|---|---|---|---|
| | **09-10** | **08-09** | **07-08** | **06-07** | **05-06** | **04-05** | **03-04** |
| Exit questionnaire part II #3<br>The MSEE students developed the ability to independently read and understand the classical and contemporary works that contribute to advancements in the chosen field. | **88** | 78 | 73 | 60 | 81 | 79 | 88 |
| Thesis survey #3<br>The ability to access and use the literature in one's field | **80** | 79 | 79 | 85 | 74 | 70 | 75 |
| **Overall average** | **84** | **79** | **76** | **73** | **78** | **74** | **82** |

**Conclusions:**

The overall average score 84, which is good, so this outcome has been met.

**<u>Outcome (d):</u> Ability to communicate effectively**

This outcome is to be realized by all EEC courses and is evaluated based on item 6 of part II in the exit survey and items 4a–4e in the thesis survey.

| Assessment strategy | | Average overall score (percent) | | | | | |
|---|---|---|---|---|---|---|---|
| | **09-10** | **08-09** | **07-08** | **06-07** | **05-06** | **04-05** | **03-04** |
| Exit questionnaire part II #6<br>The student developed the ability to make quality written and oral presentations to technically literate audiences | **100** | 72 | 72 | 64 | 77 | 83 | 90 |
| Thesis survey #4<br>The ability to communicate effectively | **92** | 83 | 85 | 88 | 82 | 84 | 84 |
| **Overall average** | **96** | **78** | **78** | **76** | **79** | **83** | **87** |

**Conclusions:**

The overall average score is 96, which is excellent, so this outcome has been met.

In order to see the details of the outcomes for communication skills, we now analyze item 4 of the thesis survey, which consists of five sub-questions. The first two (items 4a and 4b) are related to written communication skills, while the last three (items 4c, 4d and 4e) are related to oral communication skills.

| **Assessment strategy**<br>**Thesis survey #4** | **Average overall score (percent)** | | | | | | |
|---|---|---|---|---|---|---|---|
| | **09-10** | **08-09** | **07-08** | **06-07** | **05-06** | **04-05** | **03-04** |
| Written communication<br>a. Quality of the writing style<br>b. Organization of the written thesis | **89**<br>**0*** | 84<br>10* | 85<br>0* | 83<br>0* | 75<br>12* | 84<br>2* | 82 |
| Oral communication<br>c. Organization of presentation<br>d. Clarity of language usage<br>e. Quality of slides | **94**<br>**0*** | 83<br>0* | 84<br>5* | 92<br>5* | 86<br>1* | 83<br>5* | 85 |
| **Overall average** | **92** | **83** | **84** | **88** | **81** | **83** | **84** |

* The second number in each cell indicates the percentage of "unsatisfactory" grades.

**Conclusions:**

Student and faculty opinions of their communication skills are higher this year than at any time in the past. This may be due to our new technical writing course, EEC 503.

## V. Summary of Assessment Results

The following table summarizes the MSEE assessment results.

| Assessment Tools \ Outcomes | | (a) Knowledge of advanced engineering analysis and design tools | (b) Ability to use advanced engineering analysis and design tools to design practical systems | (c) Ability to access and use the literature in one's field | (d) Ability to communicate effectively | **Average for 2009/10** (08/09, 07/08, 06/07, 05/06, 04/05) |
|---|---|---|---|---|---|---|
| **Student Exit Survey (Part II)** | 1. The student developed a deeper understanding of the principles underlying a particular field of study, as well as those underlying other fields. | √ | | | | **96** (72, 71, 72, 77, 81) |
| | 2. The student developed a knowledge of the advanced methods of analysis and synthesis that are more powerful and more generally applicable than those taught at the undergraduate level. | √ | | | | **92** (73, 60, 72, 78, 79) |
| | 3. The student developed the ability to independently read and understand the classical and contemporary works that contribute to advancements in the chosen field. | | | √ | | **88** (78, 73, 60, 81, 79) |
| | 4. The student developed an insight into the significance and the limitations of the available results and methods, as well as the relationships of each other. | | √ | | | **95** (68, 72, 64, 76, 78) |
| | 5. The student developed the capacity, imagination, and courage to contribute to the advancement of the electrical engineering field. | | √ | | | **92** (66, 68, 64, 77, 81) |
| | 6. The student developed the ability to make quality written and oral presentations to technically literate audiences. | | | | √ | **100** (72, 72, 64, 77, 83) |
| **Thesis Defense Questionnaire** | 1. Knowledge of advanced engineering analysis and design tools | √ | | | | **93** (88, 84, 92, 80, 79) |
| | 2. Ability to use advanced engineering analysis and design tools to design practical systems | | √ | | | **80** (96, 89, 92, 84, 81) |
| | 3. The ability to access and use the literature in one's field | | | √ | | **80** (84, 79, 85, 74, 70) |
| | 4. The ability to communicate effectively | | | | √ | **92** (83, 85, 88, 82, 84) |
| **Averages:** | **2009/10** | **94** | **89** | **84** | **96** | |
| | 2008/09 | 78 | 77 | 81 | 81 | |
| | 2007/08 | 72 | 76 | 76 | 78 | |
| | 2006/07 | 79 | 73 | 73 | 76 | |
| | 2005/06 | 79 | 79 | 78 | 79 | |
| | 2004/05 | 80 | 80 | 74 | 83 | |

## VI. Conclusions and Recommendations

From the above assessment results and analysis, we conclude that our MSEE program met all desired outcomes. Averages for each of the four outcomes on the previous page are the highest that we have seen during the six years that we have collected assessment data.

Our collection of student survey forms needs to be more systematic. This year we received only 5 student surveys out of 26 graduates. One possibility is to ask the department Chair not to sign a degree notice of completion form until he has received a survey from the student.

One suggestion made in previous years was to look at the differences in assessment results between thesis students and non-thesis students. One way to assess the differences would be to add an item on the student exit survey form asking students to identify themselves as either a thesis student or a non-thesis student.

One way that we could assess non-thesis students would be to collect forms similar to the faculty thesis defense questionnaire for non-thesis students. We could call this a “project questionnaire” and distribute it to the faculty of courses where project reports and presentations are given by the students.

The CSU Assessment Office recommended that we consider establishing benchmark scores for acceptable performance for each outcome. This will be discussed by the ECE faculty this coming fall.

**Appendix 1. Exit Survey Results 2009-10**

| | Strongly Agree | Agree | Undecided | Disagree | Strongly Disagree | No Basis for Judgment | **Average** |
|---|---|---|---|---|---|---|---|
| **Part I – The MSEE program:** | | | | | | | |
| 1. Promotes excellence in teaching. | 2 | 3 | 0 | 0 | 0 | 0 | **88** |
| 2. Promotes excellence in research. | 3 | 1 | 0 | 1 | 0 | 0 | **84** |
| 3. Provides the best qualified faculty and promotes their development. | 3 | 1 | 1 | 0 | 0 | 0 | **88** |
| 4. Encourages faculty to obtain research funds and maintain state-of-the-art labs. | 1 | 0 | 2 | 0 | 0 | 2 | **73** |
| 5. Awards teaching assistantships to the most qualified students. | 2 | 0 | 0 | 1 | 0 | 2 | **80** |
| 6. Awards research assistantships to the most qualified students. | 3 | 0 | 0 | 1 | 0 | 1 | **85** |
| **Part II – Students Develop:** | | | | | | | |
| 1. A deep understanding of the principles underlying a particular field of study. | 4 | 1 | 0 | 0 | 0 | 0 | **96** |
| 2. A knowledge of advanced methods of analysis and synthesis that are more powerful and generally applicable than those taught at the undergraduate level. | 3 | 2 | 0 | 0 | 0 | 0 | **92** |
| 3. The ability to independently read and understand classical and contemporary works that contribute to advancements in the chosen field. | 3 | 1 | 1 | 0 | 0 | 0 | **88** |
| 4. Insight into the significance, limitations, and relationships of available results and methods. | 3 | 1 | 0 | 0 | 0 | 1 | **95** |
| 5. The capacity, imagination, and courage to contribute to the advancement of the electrical engineering field. | 3 | 2 | 0 | 0 | 0 | 0 | **92** |
| 6. The ability to make quality written and oral presentations to technically literate audiences. | 5 | 0 | 0 | 0 | 0 | 0 | **100** |

In calculating the averages, “strongly agree” is 100 points, “agree” is 80, “undecided” is 60, “disagree” is 40, and “strongly disagree” is 20. “No basis for judgment” is not counted in the average.

**Student Exit Survey, Part III Comments**

2009-10
- There are certain professors who care less about the students than about their own work.
- The program should have a class in object oriented programming.
- The program was well organized and contributed to advancement in the chosen field.

2008-09
- Need more power system courses. None of the faculty encouraged me in my field.
- The program should have a transparent procedure of graduate assistantship assignments. Courses should not be canceled.
- Some of the professors don't understand the students' questions. Some professors do not encourage students to take out-of-department courses even after degree requirements are completed. Assistantships are given on the basis of recommendations rather than student competence.

2007-08
- Need more pressure during the semester, not at the end of the semester
- Need more CE courses
- Need 2- or 3-credit courses
- More research opportunities
- Excellent (2)
- Better than earlier
- Good 500-level courses but not many advanced courses
- Liked hands-on experience
- TAs and RAs are not well assigned
- Enhanced my analytical thinking
- Flow of course infrastructure was not well organized
- Need more assistantships

2006-07
- Thanks for professors and staff
- Professors do not take thesis defense seriously. I did the work for nothing.

2005-06
- Need more computer network courses, Need more power system courses (2), Need more courses like VLSI, Need more advanced courses, Need more software courses, Need more courses
- Thanks for professors and staff
- No idea which research is going on in the department (need mini-conference)
- MSEE program is good (3), The program is very helpful to build skills in EE, Appreciate faculty's commitment in teaching and research, Professors are highly qualified

2004-2005
- Need more advanced courses (3), Need more digital/computer engineering courses, Need more courses in communication field, More computer engineering courses than necessary (2)
- Should have a greater research collaboration with local companies, Want to see more research works on software field, Need better equipment for research, More technical seminars
- Program is good, Learned a lot (5), Teachers are always ready to help, Evening classes are good for working students (2)

## Appendix 2. Thesis Defense Questionnaire Results 2009-10

| Objectives/Criteria for Evaluation | Exemplary | Satisfactory | Unsatisfactory | Averages | | |
|---|---|---|---|---|---|---|
| | | | | **09/10** | 08/09 | 07/08 |
| 1. Knowledge of advanced engineering analysis and design tools | 13 | 3 | 0 | **93** | 88 | 84 |
| 2. Ability to use advanced engineering analysis and design tools to design practical systems | 8 | 8 | 0 | **80** | 96 | 89 |
| 3. The ability to access and use the literature in one's field | 8 | 8 | 0 | **80** | 84 | 79 |
| 4. The ability to communicate effectively | | | | | | |
| a. Quality of the writing style | 10 | 6 | 0 | **85** | 88 | 84 |
| b. Organization of the written dissertation | 13 | 3 | 0 | **93** | 80 | 86 |
| c. Organization of the presentation | 13 | 3 | 0 | **93** | 88 | 83 |
| d. Clarity of language usage | 14 | 2 | 0 | **95** | 84 | 89 |

0