Texas A&M Mechanical Engineering Portfolio Assessment Procedure

1. Preface

TAMU Mechanical Engineering performs a high level educational assessment of all students in the graduate program. This assessment is used to provide feedback to the graduate program and department faculty to understand the educational outcome of our program and improve it as needed. The educational assessment is also used as part of the program accreditation process.

The assessment measures 5 high level educational goals of the graduate program. The goals are assessed using a grading rubric. Each student prepares a portfolio of graded work from their curricular study at Texas A&M that contains content that can be used to perform the assessment. The portfolio is provided to the student’s research committee in the case of MS and Ph. D. students. The research committee performs the final assessment for MS and Ph. D. students.

**The Mechanical Engineering Graduate Program advising office will not process the final thesis approval and defense forms for students until a completed rubric and portfolio is submitted.**

For Master of Engineering (M. Eng.) students, the portfolio is provided to the Graduate Program Director, Dr. Daniel McAdams. The Graduate Studies and Research Committee will perform the final assessment of the Master of Eng. students.

2. Five Educational Student Learning Outcomes

The 5 assessed educational goals of TAMU MEEN Graduate Program are the following:

A. Graduates will have the ability to apply knowledge of mathematics, science, and engineering,
B. Graduates will have the ability to identify, formulate, and solve engineering problems,
C. Graduates will have the ability to communicate effectively,
D. Graduates will have knowledge of contemporary issues and recognition of the need for lifelong learning,
E. Graduates will have the ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.

These outcomes are assessed using a 3 point scale assessment rubric. The three points are:

1) Exceeds expectations
2) Meets expectations
3) Below expectations

Also included is a **not observable** category. Not observable scores occur only in special cases. Students are expected to provide sample work showing observable accomplishments directly related to each goal.
3. Portfolio Preparation

Students will prepare a portfolio for assessment. The portfolio will be compiled over the student’s course of study at Texas A&M University. In general, the portfolio will consist of graded materials/sample work from classes or research activity (thesis) that can be evaluated and assessed against the 5 educational outcomes A through E.

Master of Science and Ph.D. Students:
- It is strongly recommended that M.S. and Ph.D. students producing a thesis or dissertation as part of their degree requirements use elements of that work or related research papers as the items used for assessment.
- Students orally defending their thesis/dissertation are encouraged to use that final oral defense presentation as the sample assessment work for Educational Outcome C: Ability to Communicate Effectively.
- Also, the Conclusions and Future Work (or similar) section of their thesis/dissertation is likely example work for assessing Educational Outcome D: Graduates will have knowledge of contemporary issues and recognition of the need for lifelong learning.

Master of Engineering Students:
M. Eng. students will need to build the portfolio over their course of study as appropriate work samples are produced in various classes. (i.e. homework, presentations, assignments, exams)

4. Portfolio Order

- The portfolio should be contained in a 3 ring binder.
- The 3 ring binder should contain tabs/dividers that separate each of the 5 educational student learning outcomes clearly marked.
- The front of the binder should be clearly titled “Assessment Portfolio, Student Name, Student UIN, and the faculty names of the research advisory committee or Dr. McAdams if a M.Eng. student.
- The portfolio should include the title page with the Aggie Honor Code and student signature underneath.
- The portfolio should include a copy of the student's transcript

The portfolio consists of 6 sections titled as follows:

0. Title Page. Front Matter and Assessments
A. Ability to Apply Knowledge of Mathematics, Science, and Engineering
B. Ability to Identify, Formulate, and Solve Engineering Problems
C. Ability to Communicate Effectively,
D. Knowledge of Contemporary Issues and Recognition of the Need for Lifelong Learning
E. Ability to Use the Techniques, Skills, and Modern Engineering Tools Necessary for Engineering Practice
0. Title Page (Contains 5 pages)

1. The title page should read “Educational Outcome Assessment”, the student’s name, UIN, degree being conferred, graduation semester and year and statement that the work in the portfolio is that of the student. (This should contain a signed copy of the Aggie Code of Honor.) See example below.

2. The second item is a table of contents.

3. The third item is an unofficial copy of the student’s transcript for the degree they are completing.

4. The fourth item in section 0 is a rubric sheet (see appendix of this document) with student name, UIN, degree being conferred, graduation year and semester, committee members and committee chairs names filled out (if an M. Eng. student leave blank committee member names blank).

5. The fifth item in section 0 is a rubric completely filled out by the student including the student’s own self-assessment scoring on the rubric.

Sample Student Educational Outcome Assessment Portfolio

Educational Outcome Assessment
Daniel A. McAdams
UIN 123456
Ph.D.
Summer, 1999

“An Aggie does not lie, cheat or steal or tolerate those who do.
On my honor, as an Aggie, I have neither given nor received unauthorized aid on this academic work.”

Student signature: ________________________________
Sample Student Educational Outcome Assessment Portfolio

Table of Contents

1. Front Matter and Assessments
   A. Ability to Apply Knowledge of Mathematics, Science, and Engineering
   B. Ability to Identify, Formulate, and Solve Engineering Problems
   C. Ability to Communicate Effectively,
   D. Knowledge of Contemporary Issues and Recognition of the Need for Lifelong Learning
   E. Ability to Use the Techniques, Skills, and Modern Engineering Tools Necessary for Engineering Practice
Page 3: Copy of the student's unofficial transcript for the degree they are completing.
The fourth item in section 0 is a rubric sheet to be completed by Faculty Advisory Committee or (if M.ENG the graduate advisory committee). It should include student name, UIN, degree being conferred, graduation year and semester, committee members and committee chairs names filled out (if an M. Eng. student leave blank committee member names blank, and list Dr. Daniel McAdams as Faculty Chair).
The fifth item in section 0 is a rubric completely filled out by the student including the student's own self-assessment scoring on the rubric. **Student should score themselves based on the sample work they provided to meet or exceed the 5 expectations.**

### Rubric as Completed by Student

<table>
<thead>
<tr>
<th>Criteria</th>
<th>Level 1</th>
<th>Level 2</th>
<th>Level 3</th>
<th>Level 4</th>
<th>Level 5</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Identify and analyze the problem</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>2. Synthesize the information</td>
<td>4</td>
<td>4</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>3. Evaluate the solutions</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>4. Communicate the solution</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>5. Reflect on the process</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
</tr>
</tbody>
</table>

**Total Score: 5/5**
Sections A contains 2 items.

1. The first item is a one-sentence statement of "My ability to apply knowledge of mathematics, science, and engineering exceeds/meets/is below the expectations of the Mechanical Engineering Graduate Program at Texas A&M University." This one sentence contains the student’s self-assessment scoring of their ability to apply knowledge of mathematics, science, and engineering and a short defense of that assessment rank.

   Below that sentence is a brief description and justification of how the example work beginning on the following page (item 2 in Section A) illustrates and justifies the specific rank (exceed/meets/is below) and applies to the specific Educational Outcome. This statement should be brief. Choose one of the examples provided.

2. **The second item in Section A is the sample/example work** taken from work done at Texas A&M for the students degree. This example work could be a test, a report for a class, a portion of research, a research paper, a class project, or similar. Any work performed by the student can be used. In the case of a multi-author research paper, the student needs to be first author. The student is encouraged to highlight and annotate the work showing specific examples related to the educational outcome being assessed and the specific rubric scoring guidelines from above.

   Sample Student Educational Outcome Assessment Portfolio

   A. Ability to Apply Knowledge of Mathematics, Science, and Engineering

   My ability to apply knowledge of mathematics, science, and engineering exceeds the expectations of the Mechanical Engineering Graduate Program at Texas A&M University.

   The work on the following page applies correct mathematical, scientific, and engineering concepts with no conceptual or procedural errors affecting the problem solution.
Sections B through E are equivalent to Section A with the modification that they contain the student's self-assessment and example work for educational outcomes B through E.

Sample Student Educational Outcome Assessment Portfolio

B. Ability to Identify, Formulate, and Solve Engineering Problems

My ability to identify, formulate, and solve engineering problems exceeds the expectations of the Mechanical Engineering Graduate Program at Texas A&M University.

Choose one of these example statements:

- The work beginning on the following page shows how I can relate theoretical concepts to practical problem solving by ........
- The work beginning on the following page shows how I use appropriate resources to locate information needed to solve problems by ........
- The work beginning on the following page shows how I take new information and effectively integrates it with previous knowledge by ........
- The work beginning on the following page shows how I demonstrate understanding of various pieces of the problem relate to each other and the whole by ......
- The work beginning on the following page shows how I formulate strategies for solving problems by ....
- The work beginning on the following page shows a correct and properly labeled answer....
- The work beginning on the following page shows how I checked the solution in multiple ways...
- The work beginning on the following page shows an appropriate interpretation...
Note Section C: In some cases, Educational Outcome C- “Ability to Communicate Effectively” may be assessed on an oral presentation. The oral presentation could be the student’s thesis or dissertation defense or an oral presentation in a class. In these cases, item two in Section C should state “Oral Presentation” and provide the title, date and the nature of the presentation (“Gear Train Redesign”, Final Presentation in MEEN 6XX on Dec. 1, 20## for example).

In the case of an oral presentation, the portion of the rubric related to outcome C needs to be completed at the time of the presentation by the course instructor who is grading the presentation or by the research advisory committee. The assessor needs to print their name, sign their name, complete, and date the rubric. This completed rubric is included in the portfolio in Section C.

Sample Student Educational Outcome Assessment Portfolio

C. Ability to Communicate Effectively

My ability to communicate effectively exceeds the expectations of the Mechanical Engineering Graduate Program at Texas A&M University.

Choose one of these example statements:

- The work beginning on the following page shows how the purpose and main ideas are exceptionally focused, clear, and interesting in my communication...
- The work beginning on the following page shows how I order and structure communication to move the audience through easily...
- The work beginning on the following page shows how main ideas are well developed by strong support and rich details...
- The work beginning on the following page shows how I use outside sources provides strong, credible support...
- The work beginning on the following page shows how I use a voice is appropriate for topic, purpose, and audience...
- The work beginning on the following page shows how I use wording this is fresh and specific, with a striking and varied vocabulary...
- The work beginning on the following page shows how I use sentences that are highly crafted, with varied structure that makes understanding easy and enjoyable...
- The work beginning on the following page shows how I communicate using strong control of standard conventions and use them well to enhance communication...
- The work beginning on the following page shows how I communicate with very few or no errors...
- The work beginning on the following page shows meticulous documentation...
D. Knowledge of Contemporary Issues and Recognition of the Need for Lifelong Learning

My knowledge of contemporary issues and recognition of the need for lifelong learning exceeds the expectations of the Mechanical Engineering Graduate Program at Texas A&M University.

Choose one of these example statements:

- The work beginning on the following page shows how I define and discusses various concepts of lifelong learning and the need for it by...
- The work beginning on the following page shows how I apply these concepts learning now and in the future by...
- The work beginning on the following page shows how I demonstrate self-awareness by accurately identifying strengths/weaknesses in my own ability to learn independently...
- The work beginning on the following page shows how I give relevant examples...
- The work beginning on the following page shows how I have deep understanding of the immediate and long term implications of my engineering work...
- The work beginning on the following page shows how I articulately express arguments from several viewpoints including the historical perspective...
E. Ability to Use the Techniques, Skills, and Modern Engineering Tools Necessary for Engineering Practice.

My ability to use the techniques, skills, and modern engineering tools necessary for engineering practice exceeds the expectations of the Mechanical Engineering Graduate Program at Texas A&M University.

Choose one of these example statements:

- The work beginning on the following page shows how I am skilled at word processing and spreadsheet use...
- The work beginning on the following page shows how I am skilled with other programs and able to write long, intricate programs...
- The work beginning on the following page shows how I able to direct others in drawing preparation and checking...
- The work beginning on the following page shows how I am skilled at modeling and related analysis...
- The work beginning on the following page shows how I have a broad understanding of manufacturing methods...
- The work beginning on the following page shows how I am able to manage others in a group that can design parts easily manufactured using an appropriate manufacturing method...
5. Portfolio Preparation and Submission Process

Students should compile the portfolio over their course of study at Texas A&M. MS and Ph.D. students who are preparing a thesis or dissertation will be assessed by their research advisory committee. MS and Ph.D. students will provide the assessment portfolio to their committee when they circulate the final thesis or dissertation to the committee for review. It is expected that the research advisory committee will complete the assessment of the student’s work at the defense. One fully completed assessment portfolio is turned into the Mechanical Engineering Graduate Program Office after the defense.

Master of Engineering students will turn a completed, with the exception of the faculty assessment, portfolio to the Mechanical Engineering Graduate Program Office. The final assessment of that student’s work will be performed by the Graduate Studies and Research Committee. M. Eng. students submit the assessment portfolio to the Graduate Program Office by the 10th week of the long semester in which they plan to graduate or the 6th week of the summer semester if graduating in summer.

Please make sure you have submitted:

- Your work in a binder
  - With clearly marked sections
  - Your name and UIN somewhere on the cover/spine
  - No stapled work

- 2 NEAT COPIES of the rubric
  - One for the student (please label as so and fill out)
  - One of the faculty
  - Please use the large, legible copies provided in other document

Examples: WHAT NOT TO DO

- NO BINDER
- DIRTY, PRACTICALLY EMPTY
- HUGE, UNNECESSARY MATERIAL
Examples: WHAT TO DO

- BINDER
- NEAT
- ORGANIZED WITH TABS
- NECESSARY MATERIALS IN PLACE
- SIGNED HONOR CODE
- COPY OF TRANSCRIPT
- 2 COPIES OF RUBRICS