FRESNO STATE
Lyles College of Engineering

ANNUAL REPORT ON ASSESSMENT OF
M.S. IN MECHANICAL ENGINEERING (ME) PROGRAM
ACADEMIC YEAR 2015-2016

PREPARED BY

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Master of Science Mechanical Engineering

Please download this document and provide a response to each question in the appropriate section. Send your assessment reports to Dr. Angel Sanchez (aansanchez@csufresno.edu) in the Office of Institutional Effectiveness and copy Dr. Melissa Jordine (mjordine@csufresno.edu). Please complete a separate report for each Bachelors and Master's program offered by the department.

1. **What learning outcome(s) did you assess this year?** List all program outcomes you assessed (if you assessed an outcome not listed on your department SOAP please indicate explain). Do not describe the measures or benchmarks in this section Also please only describe major assessment activities in this report. The G.E. Committee will issue a separate call for G.E. assessment reports.

SLO 4.1: Students will be proficient in writing in general, especially in writing technical documents, research reports, and proposals.

SLO 5.1: Students will be proficient in solving advanced problems in engineering analysis and design through the use of mathematical analysis, differential equations, finite element methods, finite differences, or least square errors.

2. **What instruments (assignment) did you use to assess them?** If the assignment (activity, survey, etc.) does not correspond to the activities indicated in the timeline on the SOAP, please indicate why. Please clearly indicate how the instrument (assignment) is able to measure the outcome. If after evaluating the assessment you concluded that the measure was not clearly aligned or did not adequately measure the outcome please discuss this in your report. Please include the benchmark or standard for student performance in your assessment report (if it is stated in your SOAP then this information can just be copied into the report). An example of an expectation or standard would be "On outcome 2.3

For SLO 4.1 we used ME graduate students writing performance in the mandatory ENGR 200 course (Seminar in Engineering for graduate students). ENGR 200 serves as an essential graduate course that prepares student for analyzing technical texts, delivering oral presentations, and most importantly writing engineering reports and technical manuscripts. Successful completion of this course fulfills the graduate writing requirement for MSME student. Here are the sample assignments in ENGR 200 that we used for assessing the SLO 4.1.

HML Research Workshop Summary
One page report on Henry Madden Library Research Workshop Submit: Hardcopy in class, Digital copy (on line for Turnitin) (50 pts)

Final Project Title and Abstract
Submit a title and abstract (100-250 words) for your final project
Submit: Hardcopy in class, Digital copy (on line for Turnitin) (50 pts)

Cover Letter to an Employer Plus Resume
Submit a cover letter to an employer plus resume (use general guidelines provided author in textbook and discussion in course)
Submit: Hardcopy in class, Digital copy (on line for Turnitin) (50 pts)

Final Report (Term Paper)
No less than 4,000 words with figures. Formatted per ASME or IEEE guidelines.
Submit: Hardcopy in class, Digital copy (on line for Turnitin) (100 pts)
Term paper is a literature review on engineering topic of student's choice that had been pre-approved when they submitted the title and abstract earlier in the semester. Rubric for quality of paper was submitted with results. In addition, all papers were submitted through *Turn it in* to assess for plagiarism, as detailed in the rubric. Figures in paper were in support of the writing and topic. They could be line figures, pictographs, schematics, pie charts, etc.

Master of Science in Mechanical Engineering

Rubric for Graduate Writing

	1 Deficient	2 Adequate	3 Proficient	4 Exemplary	Score
Style and format	While some discipline-specific conventions are followed, others are not. Paper lacks consistency of style and/or format.	Style and format are broadly followed, but inconsistencies are apparent. The style may be difficult to follow so as to detract from the comprehensibility of the manuscript.	May be minor errors. Conventions for style and format are used consistently throughout the paper. Style and format contribute to comprehensibility. Suitably models discipline's overall style.	Paper consistently models the language and conventions used in the scholarly/professional literature. The manuscript meets the guidelines for submission for publication in a peer reviewed journal.	
Mechanics	Frequent errors in spelling, grammar (such as subject/verb agreements and tense), sentence structure, and/or other writing conventions make reading difficult and interfere with comprehensibility.	Grammatical conventions are generally used, but inconsistency and/or errors in use result in weak connections between topics in the formulation of the argument. Poor or improper use of headings and related features.	May be minor errors although the paper follows normal conventions of spelling and grammar throughout. Errors do not significantly interfere with topic comprehensibility. Transitions and organizational structures are effective.	Essentially error-free in terms of mechanics. Writing flows smoothly from one idea to another. Transitions effectively establish a sound scholarly argument and aid the reader in following the writer's logic.	
Content and organization	Logically and thematically coherent, but is lacking in substantial ways. Content may be poorly focused or the scholarly argument weak or poorly conceived. Major ideas related to the content may be ignored or inadequately explored. Requires significant revision.	Ideas presented closely follow conventional concepts with little expansion and development of new directions. Ideas and concepts are generally satisfactorily presented although lapses in logic and organization are apparent.	Follows all requirements. Topic is carefully focused. Clearly outlines the major points related to the topic; ideas are logically arranged to present a sound scholarly argument. Interesting and holds the reader's attention. Credible job of summarizing literature.	Excels in organization and representation of ideas related to the topic. Raises important issues or ideas which may not have been represented in the literature cited. Would serve as a good basis for further research on the topic.	
Integration and critical analysis.	Weakness is evident in the coverage of the field and analysis resulting in incorrect or poorly developed synthesis of results. Analysis is limited to categorizing and summarizing topics.	Identification of key topics or uncertainties in the field may be incomplete. New concepts resulting from a synthetic presentation of ideas is poorly developed or lacking.	Inconsistencies in organization and logic of the presentation, but still clear analysis of the presented materials. Varying degrees of development of synthesis of all aspects of the topic. Overall consistency, thoroughness, and analysis result in a well-crafted document.	Current state of knowledge is addressed. Complete grasp of the literature across multiple research approaches using appropriate journals. Multiple sources are accurate and concise. Organizationally, smooth and effective transitions between topics.	
Originality	Mostly unoriginal and copious evidence of plagiarism (>50% in Turnitin or SafeAssign)	Much unoriginal and much evidence of plagiarism (25-50% in Turnitin or SafeAssign)	Some unoriginal and some evidence of plagiarism (10-25% in Turnitin or SafeAssign)	Nearly all original with very little evidence of plagiarism (0-10% in Turnitin or SafeAssign))	
Total					

For **SLO 5.1** we used the ENGR 202 (Applied Engineering Analysis) final exam score. ENGR 202 is the main course in MSME program that addresses use of mathematical analysis for solving advanced engineering problems. The course directly and exclusively covers mathematical analysis, differential equations, linear algebra, and the foundation for numerical methods such as finite differences and finite element method.

3. **What did you discover from the data?** Discuss the student performance in relation to your standards or expectations. Be sure to clearly indicate how many students did (or did not) meet the standard for each outcome measured. Where possible, indicate the relative strengths and weaknesses in student performance on the outcome(s).

SLO 4.1: The review of the assessment data shows that MSME graduate student require more training and preparation for technical writing and report development. This is partially due to the fact that most of the engineering graduate students are international, and therefore, are still developing language skills. More scrupulous screening of incoming graduate students (particularly about their writing requirement) and constant monitoring of continuing graduate students will be beneficial in this regard. More oversight of graduate theses and research projects (including multi-faculty committees) helps keep students on track for developing better technical writing capability. Here are the summary of the assessment data:

HML Research Workshop Summary
One page report on Henry Madden Library Research Workshop Submit: Hardcopy in class, Digital copy (on line for Turnitin) (50 pts)
Assessment
Graded per rubric: mean=18.57, standard deviation =2.23, range=13-20, n=26

Final Project Title and Abstract
Submit a title and abstract (100-250 words) for your final project
Submit: Hardcopy in class, Digital copy (on line for Turnitin) (50 pts)
Assessment
Graded per rubric: mean=37.69, standard deviation =3.73, range=25-45, n=26

Cover Letter to an Employer Plus Resume
Submit cover letter to an employer plus resume (use general guidelines provided author in textbook and discussion in course)
Submit: Hardcopy in class, Digital copy (on line for Turnitin) (50 pts)
Assessment
Graded per rubric: mean=37.77, standard deviation =2.59, range=30-40, n=26

Final Report (Term Paper)
No less than 4,000 words with figures. Formatted per ASME or IEEE guidelines.
Submit: Hardcopy in class, Digital copy (on line for *Turnitin*) (100 pts)

Assessment

Graded per rubric: mean=81.58, standard deviation=14.44, range=51-100, n=26
17 out of 26 enrolled students scored above the 80% target (80/100 points)

SLO 5.1: ENGR 202 final exam scores of seven participating students in fall 2015 class were studied as the direct measure for this assessment. Standard performance has been set as scoring 70% and above, which corresponds to satisfactory level to excellent level of mathematical analysis for engineering students. Out of seven graduate students, five students scored between 70% to 100%, one scored 54%, and one withdrew from the course. The average score and standard deviation were recorded as 82.83 and 19.88, respectively, indicating 71.4% of students have met or exceeded the standard for the outcome.

Further study of the students' performance in this course reveals that MSME students perform better on the problems where the mathematical models are already developed, compared to the cases that they are required to develop the mathematical models prior to solving the problems. In other words, while MSME students are highly capable of solving engineering problems with well-developed mathematical formulation, they are occasionally challenged by developing mathematical models of physical scenarios and engineering problems.

4. **What changes did you make as a result of the data?** Describe how the information from the assessment activity was reviewed and what action was taken based on the analysis of the assessment data.

SLO 4.1: The ME department has decided to incorporate strong elements of technical writing training and evaluation into various MSME courses. In particular, the students inputs for ME 290 (MSME Independent Study), ME 298 (MSME Project), and ME 299 (MSME Thesis), will assess based on their writing merit, in addition to their technical quality. ME department has also decided to adopt a uniform rubric for evaluating students writing proficiency. Consequently, the MSME students will routinely receive feedbacks and instruction on their writing techniques.

SLO 5.1: Based on the assessment data, the department has decided to place more emphasis on enhancing students' capability for developing mathematical models of different physical scenario and realistic engineering problems. More examples and topics focusing on mathematical formulation process have included for the next ENGR 202 course, as well as ME 241 (Structural Analysis and Elasticity), ME 211 (Advanced Dynamics) and ME 221 (Incompressible Fluids).
Moreover, the ME department has decided to include training and lectures addressing engineering simulation software packages, such as finite element method and computational fluid mechanics, to MSME curriculum. It is anticipated that the addition of

such trainings will provide students with improved analytical skills for developing mathematical models from different physics and engineering scenarios.

General: The department has appointed a new graduate coordinator to more effectively screen incoming graduate students and monitor continuing graduate students. More oversight of graduate theses and research projects (including multi-faculty committees) helps keep students on track. Additionally, more flexibility in allowed graduate courses provides breadth to the program.

5. **What assessment activities will you be conducting in the 2016-2017 AY?** List the outcomes and measures or assessment activities you will use to evaluate them. These activities should be the same as those indicated on your current SOAP timeline; if they are not please explain.

SLO 3.1 Students will understand and apply the latest procedures for analysis in Mechanical Engineering or Engineering.

Assessment Measure:

MSME Graduate Students and Alumni Survey.

MSME Students Final Theses and Projects.

SLO 4.2 Students will be proficient in oral and public presentations in front of technical and non-technical audiences.

Assessment Measures:

Presentation on ENGR 200 Final Report

Submit presentation on your final report (10-12 slides) and provide a five minute oral presentation to instructor and classmates. Use proper presentation format (e.g., title slide, outline, main body, conclusions). For slides, submit: Hardcopy in class, Digital copy (on line for Turnitin). For oral presentation: Five-minute oral delivery with projected slides to as classmates and instructor in classroom setting.

Assessment

- Presentation slides (50 pts)
- Oral presentation (graded per rubric as the average of instructor and on student evaluator) (100 pts)

Presentation on Oral Defense of Thesis or Project

Evaluation and Rubrics for public oral presentations by graduate students in fron of technical and non-technical audience

Evaluation of Oral Presentation

Date:_____

Title:_____
_____

Presenter: _____

Title of Presentation (0 to 3 points) _____
Introduction (0 to 3 points) _____
Outline of Presentation (0 to 4 points) _____

Voice
- Clear (0 to 5 points) _____
- Loud (0 to 5 points) _____

Delivery
- Enthusiastic (0 to 5 points) _____
- Eye contact with audience (0 to 5 points) _____

Audiovisual Materials
- Quantity (0 to 5 points) _____
- Quality (0 to 5 points) _____

Organization of Presentation
- Logical progression (0 to 10 points) _____

Contents
- Completeness (0 to 15 points) _____
- Technically correct (0 to 20 points) _____

Timing
- Effective use of time (0 to 5 points) _____

Addressing of Questions (0 to 5 points) _____

Comments:

SCORE_____points

Maximum: 100 points

6. **What progress have you made on items from your last program review action plan?** Please provide a brief description of progress made on each item listed in the action plan. If no progress has been made on an action item, simply state "no progress."

- **Revised the common core to make it more relevant to three options within the M.S. Engineering program. –** Major revisions were approved in 2014 with **at least six new courses added in the last three semesters**.

- **Revised the mechanical engineering curriculum to shift emphasis from aerospace to the three areas identified in the vision statement**. MSME with focal areas of advanced materials, alternative energy, and mechatronics has been included in documents that have been prepared and website updates are in the works.

- **Expanded course offerings from the current 3 to 4 courses per semester to at least 6 to 8 courses per year.** With the **addition of new faculty** over the last three years the number of new or revised graduate courses offered each semester has significantly increased. In 2016, the list of graduate courses and their frequency of offering will be finalized.

- **Upgraded research facilities**. Approximately $250,000 of Lyles Gift funds has been expended to address over $1.5 M of deferred maintenance and modernization of ME facilities. Although most of these investments are for teaching laboratories, some of the facilities are for dual use (teaching and research).

- **Increase graduate student enrollment with emphasis on 5-year BS/MS program and local students** – In AY2015-16, ME graduate enrollment has increased from 4 to 5 to 15 with a target of 20. Although the number of new international students enrolling did not reach the target for the current AY, the number of new local graduate students exceeded the target.

Additional Guidelines: If you have not fully described the assignment then please attach a copy of the questions or assignment guidelines. If you are using a rubric and did not fully describe this rubric (or the criteria being used) than please attach a copy of the rubric. If you administered a survey please attach a copy of the survey so that the Learning Assessment Team (LAT) can review the questions.

Not applicable