

Annual Graduate Program Report

Mechanical Engineering Department (MEEG)
University of Arkansas
Fayetteville, AR

Degree Programs:

Mechanical Engineering (MSME, thesis option)
Master of Science in Mechanical Engineering (MSME, non-thesis option), and
Doctor of Philosophy (PhD) in Engineering.

Period of Interest

Summer, Fall, and Spring
May 16, 2015 – May 15, 2016

Date:

Friday, May 27, 2016

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MEEG Staff Support

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PROGRAM GOALS

During the Fall 2015 semester, the UA's College of Engineering (COE) published a new strategic plan¹. The plan includes the new motto, "Preparing You for Your Tomorrow"; and the below stated vision; growth goals; and objectives and strategies.

COE Vision

Pursue excellence in research, scholarship, and education, ensuring personal and professional growth for future generations of engineering leaders who will stimulate prosperity for Arkansas, the nation and the world.

COE 2021 Balanced Growth Goals

- Top 50 ranking among public universities
- 3500 undergraduate students
- 1000 master's students
- 350 doctoral students
- 135 tenure-track faculty
- 65 clinical and research faculty
- 240 staff members
- \$300,000 in research expenditures per faculty

COE Objectives and Strategies

- Objective 1: Increase student quality and diversity
- Objective 2: Provide student-centered education
- Objective 3: Recruit and retain high-quality faculty and staff
- Objective 4: Increase research productivity
- Objective 5: Increase economic development
- Objective 6: Increase alumni and corporate support
- Objective 7: Provide high-quality infrastructure

Now that the COE has established their strategic plan, the Mechanical Engineering Department (MEEG) has begun the process of developing a new departmental strategic plan that aligns with both the COE and UA's plans. Currently, our program goals are broad general statements of what MEEG Graduate Program (both MSME and PhD) intends to accomplish and describes what a student will be able to do after completing the degree requirements. The program goals are linked to the mission of the university and college. For MEEG they are:

1. Prepare students for independent studies in mechanical engineering.
2. Prepare students to contribute new knowledge of fundamental or applied importance.
3. Prepare students to disseminate new knowledge of fundamental or applied importance.

¹ <https://engineering.uark.edu/about-us/strategic-plan/>

MEEG STUDENT LEARNING OUTCOMES (SLOS)

MEEG Student Learning Outcomes are defined in terms of the knowledge, skills, and abilities that students will know and be able to do as a result of completing a program (either MSME or PhD). These student learning outcomes are directly linked to the accomplishment of the program goals listed above. They are:

MSME SLOs:

1. Students will gain advanced knowledge in mechanical engineering.
2. a. Thesis: Students will gain a necessary understanding of their research field.
b. Non-thesis: Students will apply advanced coursework to an engineering problem.
3. a. Thesis: Students will contribute new knowledge of fundamental or applied importance.
b. Non-thesis: Students will demonstrate important application(s) of existing knowledge.
4. Students will be able to communicate effectively during oral presentations.
5. Students will be able to communicate effectively in writing.

PhD SLOs:

1. Students will gain advanced knowledge in mechanical engineering.
2. Students will show proficiency in the foundational topics of mechanical engineering.
3. Students will gain an understanding of their research field to contribute new knowledge.
4. Students will contribute new knowledge of fundamental or applied importance.
5. Students will be able to communicate effectively during oral presentations.
6. Students will be able to communicate effectively in writing.

PROCESS FOR ASSESSING STUDENT LEARNING OUTCOMES (SLOS)

Prior to the fall 2015 semester, the process for assessing student outcomes included five assessments for MS students and seven for PhD.

For MS students, they were:

1. graduate cumulative GPA;
2. annual graduate student academic review;
3. graduate seminar;
4. written thesis or project report (non-thesis); and
5. oral defense of thesis or project report.

For PhD students, they were:

1. graduate cumulative GPA;
2. annual graduate student academic review;
3. participation in graduate seminar;
4. combined written and oral qualifying exam;
5. dissertation proposal;
6. written dissertation; and
7. oral defense of dissertation.

The graduate faculty approved a detailed academic assessment plan in August 2015, which became effective the fall 2015 semester. This new assessment plan is expected to provide better program assessment and feedback for continuous improvement. In addition to defining the MEEG graduate program goals and student learning outcomes (SLOs), detailed performance surveys will be used to supplement existing assessment measures. The surveys are periodically completed by graduate students, their major advisors, and their faculty advisory committee members throughout a student's program period. In particular, these performance surveys explore beyond the previous annual 'satisfactory or unsatisfactory progress' check. Each survey asks about overall student progress, interactions with the student's peers and major advisor/committee member, level of effort, and oral/written communication skills.

For the new fall 2015 assessment process, the assessment measures (see Tables 1 and 2) are matched with their related SLOs. Samples of standard forms (i.e., annual graduate student academic review, graduate student performance survey (self-assessment and advisor) are available upon request. All data are collected by the Assistant to the Graduate Program Coordinator and recorded in a spreadsheet for analysis. Data are to be reviewed annually by the MEEG Graduate Studies Committee and results reported to the Dean of the College of Engineering (COE) by the Chair of the MEEG Graduate Studies Committee. Future plans are for the data to be entered into an Access Database of Graduate Student Progress which will allow for improved analysis and access to historical data.

Note that since the MEEG graduate program completed an extensive external review and response report in May 2016, the additional data from spring 2016 has yet to be reviewed by the MEEG Graduate Studies Committee. This will occur prior to the annual MEEG August faculty retreat.

Table 1. Means of assessment for MSME (thesis/non-thesis) students.

Student Learning Outcome	Assessment Measure
1. Academic Progress Toward Gaining Advanced Knowledge	Cumulative GPA. Annual Graduate Student Academic Review.
2a. Understanding of Field	Student self-assessment in Graduate Student Performance Survey. Thesis defense, Graduate Student Performance Survey.
2b. Applying Coursework	Student self-assessment in Graduate Student Performance Survey. Project presentation, Graduate Student Performance Survey.
3. Contribute New Knowledge	Student self-assessment in Graduate Student Performance Survey. Thesis defense / project presentation, Graduate Student Performance Survey.
4. Communicate Orally	Graduate Seminar, Student self-assessment in Performance Survey. Thesis defense / project presentation, Graduate Student Performance Survey.
5. Communicate in Writing	Student self-assessment in Graduate Student Performance Survey. Thesis / project report, Graduate Student Performance Survey.

Table 2. Means of assessment for PhD students.

Student Learning Outcome	Assessment Measure
1. Academic Progress Toward Gaining Advanced Knowledge	Cumulative GPA. Annual Graduate Student Academic Review.
2. Foundational Proficiency	Cumulative GPA. Ph.D. qualifying exams in 3 selected areas of mechanical engineering.
3. Understanding of Field	Student self-assessment in Graduate Student Performance Survey. Candidacy exam (PhD proposal), Dissertation, Graduate Student Performance Survey.
4. Contribute New Knowledge	Student self-assessment in Graduate Student Performance Survey. Candidacy exam (PhD proposal), Dissertation, Graduate Student Performance Survey.
5. Communicate Orally	Graduate Seminar, Student self-assessment in Performance Survey. Candidacy exam, Dissertation defense.
6. Communicate in Writing	Student self-assessment in Graduate Student Performance Survey. Candidacy exam, Dissertation.

I. PROGRAM ASSESSMENT RESULTS

Including the newly added detailed graduate student survey, there are eight assessment measures:

1. Cumulative GPA
2. Annual graduate student academic review
3. Graduate student performance survey
4. Participation in graduate seminar
5. PhD qualifying exam
6. Candidacy exam (i.e., PhD dissertation proposal)
7. Oral defense of MS thesis, MS project, or PhD dissertation
8. Written MS thesis, MS project, or PhD dissertation

Results for summer 2015, fall 2015, and spring 2016 are given below and discussed with regard to SLOs.

Cumulative GPA

MS SLOs: #1 – Gain advanced knowledge (i.e., academic progress)

PhD SLOs: #1 – Gain advanced knowledge (i.e., academic progress)

#2 – Foundational proficiency

Table 3 provides the cumulative GPA for MEEG graduates. Review of the student GPA shows that students are proficient and making adequate progress in their course work at the graduate (advanced knowledge) level. There appears to be no issues or concerns through review of this measure.

Table 3. Cumulative GPA for MEEG graduates.

<u>Degree</u>	<u>Student Name</u>	<u>Term</u>	<u>Cum. GPA</u>
MEEGMS	Barrows, Wesley A.	1156	4.00
MEEGMS	Maiga, Abdoul K.	1156	3.67
MEEGMS	Ballew, Brian G.	1159	3.91
MEEGMS	McMullen, Carlton	1159	3.22
MEEGMS	Huisman, Nicholas S.	1159	3.63
MEEGPH	Algarni, Salem A. M.	1159	3.80
MEEGPH	Zhang, Wenyang	1163	3.70

Annual Graduate Student Academic Review

MS SLOs: #1 – Gain advanced knowledge (i.e., academic progress)

PhD SLOs: #1 – Gain advanced knowledge (i.e., academic progress)

Table 4 below provides the results from recent (spring 2016) annual graduate student academic review forms. Students are required to annually get feedback from their major advisor with regard to their progress toward graduation. The form allows for only a rating of satisfactory or unsatisfactory. Review of the historical and this year’s annual review data show that students are generally making satisfactory progress. There appears to be no issues or concerns through review of this measure.

Table 4. Annual graduate student academic reviews.

<u>Academic Year</u>	<u>Number Satisfactory</u>	<u>Number Unsatisfactory</u>
2016	21	0

Graduate Student Performance Surveys

MS SLOs: #2a – Understanding of field
#2b – Applying coursework
#3 – Contribute to new knowledge
#4 – Communicate orally
#5 – Communicate in writing

PhD SLOs: #3 – Understanding of field
#4 – Contribute to new knowledge
#5 – Communicate orally
#6 – Communicate in writing

Tables 5 and 6 below are the first and second semester (i.e., preliminary) results from the new graduate student performance surveys. Please note that these surveys were created in an effort to better assess several of the SLOs from several perspectives. The surveys are required prior to enrolling each semester by the student and student’s major advisor. The surveys are also

required after the oral defense (i.e., MS thesis/project or PhD dissertation) by the student, major advisor, and all thesis/project/dissertation committee members.

At this time, there are no obvious issues, but the data are insufficient to fully assess with this measure.

Table 5. Statistics from student self-assessment in graduate student performance surveys (fall 2015 and spring 2016).

Term: fall 2015 (1159)

Number of Surveys Completed: 21

Question	Mean	Standard Deviation
Overall Academic Progress	4.22	0.65
Overall Research Progress	3.56	0.86
Quantity of Interaction with Prof.	4.06	0.87
Quality of Interaction with Prof.	4.22	0.65
Quantity of Interaction with Peers	3.89	0.96
Quality of Interaction with Peers	4.11	0.83
Time Spent in Lab/Office	3.94	0.73
Effort Level on Research	3.89	0.96
Oral Communication	3.94	0.87
Written Communication	3.83	0.71

Term: spring 2016 (1163)

Number of Surveys Completed: 22

Question	Mean	Standard Deviation
Overall Academic Progress	4.32	0.69
Overall Research Progress	3.94	0.90
Quantity of Interaction with Prof.	4.36	0.77
Quality of Interaction with Prof.	4.69	0.51
Quantity of Interaction with Peers	4.16	0.90
Quality of Interaction with Peers	4.36	0.77
Time Spent in Lab/Office	4.30	0.89
Effort Level on Research	4.45	0.77
Oral Communication	4.25	0.67
Written Communication	4.27	0.71

Table 6. Statistics from major advisor or committee member graduate student performance surveys (fall 2015 and spring 2016).

Term: fall 2015 (1159)

Number of Surveys Completed: 21

Question	Mean	Standard Deviation
Overall Academic Progress	4.40	0.75
Overall Research Progress	4.15	0.75
Quantity of Interaction with Prof.	4.45	0.69
Quality of Interaction with Prof.	4.32	0.67
Quantity of Interaction with Peers	4.32	0.82
Quality of Interaction with Peers	4.26	0.81
Time Spent in Lab/Office	4.05	0.97
Effort Level on Research	4.26	0.81
Oral Communication	4.57	0.60
Written Communication	4.25	0.64

Term: spring 2016 (1163)

Number of Surveys Completed: 23

Question	Mean	Standard Deviation
Overall Academic Progress	4.35	0.77
Overall Research Progress	3.87	1.01
Quantity of Interaction with Prof.	4.20	0.98
Quality of Interaction with Prof.	4.09	0.98
Quantity of Interaction with Peers	3.94	1.10
Quality of Interaction with Peers	3.97	1.02
Time Spent in Lab/Office	4.11	0.96
Effort Level on Research	4.13	0.80
Oral Communication	4.12	0.79
Written Communication	4.03	0.66

Participation in Graduate Seminar

MS SLOs: #4 – Communicate orally

PhD SLOs: #5 – Communicate orally

Graduate students are required to enroll in MEEG 6800 Graduate Seminar each semester. Students are also required to give a presentation on their research topic once per year. From the recent external review self-study report and analysis, it was found that for all but one student, MS students typically give either one or two presentations prior to graduation. For PhD students, they give on average 2.8 presentations.

Recent action: Based on a review of the historical information, it was apparent that the current goal of each graduate student giving one graduate seminar presentation each year was not being met. Therefore, students are no longer allowed to sign up for their presentation on a volunteer basis. Each semester's presentations are now tracked and participation is required based on frequency. It is expected that all MS students should give a minimum of one presentation and all PhD students should give a minimum of three presentations in MEEG 6800 prior to graduation. This recommendation was made by the Graduate Studies Committee on December 17, 2015. Ten students gave Graduate Seminar presentations during the fall 2015 semester and eleven during spring 2016 semester.

PhD Qualifying Exam

MS SLOs: n/a

PhD SLOs: #2 – Foundational proficiency

The purpose of the qualifying examination is to determine the ability of the student to understand fundamental mechanical engineering principles and apply them to the solution of problems. Those who fail all or parts of the exam are required to take only the failed part(s) a second time. The qualifying exam consists of three written exams, each 2 hours long, in subject areas chosen by the student. Each is followed by a ½ hour oral exam in the week following the written exam. The qualifying examination results, together with the individual's academic record, engineering experience, evidence of ability to conduct independent research, and other material are used by the graduate faculty to determine if an applicant is allowed to continue in the PhD program.

Table 7 below gives a summary of the year’s fall and spring qualifying exam results for each student. Also given are the subject areas chosen by each student. Review of the qualifying exam results show that students are generally demonstrating a foundational academic proficiency with the chose subject matter/topic. There appears to be no issues or concerns through review of this measure.

Table 7. PhD qualifying exam results for MEEG graduates.

Semester	Year	First Name	Last Name	Course Subject	Attempt	Result
Fall	2015	Charlie	DeStefano	Mechanical Design	1	pass
Fall	2015	Charlie	DeStefano	Mechanics of Materials	1	pass
Fall	2015	Charlie	DeStefano	System Dynamics and Control	1	pass*
Fall	2015	Joe	Simpson	Fluids	2	pass
Fall	2015	Joe	Simpson	Thermodynamics	2	pass*
Spring	2016	Yang	Zhao	Mechanics of Materials	1	pass
Spring	2016	Yang	Zhao	Statics and Dynamics	1	pass
Spring	2016	Yang	Zhao	Heat Transfer	1	pass*
Spring	2016	Joseph	Hill	Mechanics of Materials	1	pass
Spring	2016	Joseph	Hill	Materials	1	pass
Spring	2016	Joseph	Hill	Computational Methods	1	pass*
Spring	2016	Scott	Muller	Mechanics of Materials	1	pass
Spring	2016	Scott	Muller	Materials	1	pass
Spring	2016	Scott	Muller	Computational Methods	1	pass*
*indicates student passed last of three qualifying exams						

PhD Candidacy Exam (i.e., PhD dissertation proposal)

MS SLOs: n/a

PhD SLOs: #2 – Understanding of field

A dissertation proposal is the first step in meeting the dissertation requirement. The proposal is submitted to the research advisor and doctoral dissertation committee. The student gives a public seminar on the proposed work soon thereafter, and an oral examination on the merits of the proposed work and the student’s knowledge in the field of the proposal is conducted by the doctoral dissertation committee. The purpose of the exam is to approve the proposal and to determine if the student has the knowledge to do the proposed research. Final approval of the proposal after the oral exam rests with the doctoral dissertation committee.

Table 8 below gives a list of PhD candidates who passed their candidacy exams this year. In addition, a recent review of the semesters when each candidacy exam occurred compared to the degree completion date shows that students are presenting their research proposal well in advance of graduation. Based on this and the historical data review, there appears to be no issues or concerns through review of this measure.

Table 8. PhD candidacy exam completed this year.

Student Name	Term	Candidacy Exam Status
Burek, Jasmina	1159	pass
Bello, Oladapo	1163	pass
Carmack, Joseph	1163	pass

Oral Defense of MS Thesis, MS Project, or PhD Dissertation

MS SLOs: #4 – Communicate orally

PhD SLOs: #5 – Communicate orally

and

Written MS Thesis, MS Project, or PhD Dissertation

MS SLOs: #5 – Communicate in writing

PhD SLOs: #6 – Communicate in writing

The last two steps in a student’s work prior to graduating are normally writing and orally defending their MS thesis/project or PhD dissertation. Verification of progress or success in this area is partially assessed by the fact the student graduated. Table 9 provides a list of recent graduates during the year of interest. There appears to be no issues or concerns through review of this measure.

Table 9. List of degree and graduation dates for MEEG graduates.

Degree	Student Name	Term	Advisor
MEEGMS	Barrows, Wesley A.	1156	Spearot
MEEGMS	Maiga, Abdoul K.	1156	Huang
MEEGMS	Ballew, Brian G.	1159	Wejinya
MEEGMS	McMullen, Carlton	1159	Tung
MEEGMS	Huisman, Nicholas S.	1159	Jensen
MEEGPH	Algarni, Salem A. M.	1159	Nutter
MEEGPH	Zhang, Wenyang	1163	Malshe

Conclusion

Based on the given assessment measures, it appears that all the student learning outcomes (SLOs) are being met by the MEEG graduate program at both the MS and PhD levels. Minor corrections have been noted related to student’s oral communication outcome (i.e., MS SLO #4 and PhD SLO #5) and improvements made to the Graduate Seminar course. Finally, future assessments will be strengthened through the implementation of the newly adopted graduate student performance surveys.