



**WICHITA STATE
UNIVERSITY**

Program Review Self-Study Template

Academic unit: Mechanical Engineering

College: Engineering

Date of last review: _____

Date of last accreditation report (if relevant): Fall 2006

List all degrees described in this report (add lines as necessary)

Degree: BS Mechanical Engineering

CIP* code: 14.19

Degree: MS Mechanical Engineering

CIP code: 14.19

Degree: PhD Mechanical Engineering

CIP code: 14.19

*To look up, go to: Classification of Instructional Programs Website, <http://nces.ed.gov/ipeds/cipcode/Default.aspx?y=55>

Faculty of the academic unit (add lines as necessary)

Name

Signature

Ikram Ahmed (Associate Professor)

Ramazan Asmatulu (Associate Professor)

Brian Driessen (Associate Professor)

David Koert (Associate Professor and Chair)

Hamid Lankarani (Professor)

Michael McCoy (Visiting Assistant professor)

Michael L. McCoy 6/29/12

Bob Minaie (Professor)

T.S. Ravigururajan (Professor)

T.S. Ravigururajan 6/29/12

Submitted by: Hamid Lankarani (Professor)
(name and title)

Date _____

1. Departmental purpose and relationship to the University mission (refer to instructions in the WSU Program Review document for more information on completing this section).

a. University Mission:

Wichita State University is committed to providing comprehensive educational opportunities in an urban setting. Through teaching, scholarship and public service the University seeks to equip both students and the larger community with the educational and cultural tools they need to thrive in a complex world, and to achieve both individual responsibility in their own lives and effective citizenship in the local, national and global community.

b. Program Mission (if more than one program, list each mission):

The Mechanical Engineering Department at Wichita State University offers a Bachelor of Science degree (BSME), a Master of Science degree (MSME), and a Doctor of Philosophy degree (PhDME).

The mission of the **Bachelor of Science in Mechanical Engineering (BSME)** program is to provide students with a broad mechanical engineering education, to help advancing the mechanical engineering profession, and to contribute toward the economic development of the state of Kansas.

The mission of the **Master of Science in Mechanical Engineering (MSME)** program is to provide the graduate students with an in-depth knowledge through advanced mechanical engineering courses, to introduce graduate students to the process of research through course work, to educate students in comprehensive research through project work or thesis, and to prepare MS graduates for continued graduate study towards PhD in engineering.

The mission of the **Doctor of Philosophy in Mechanical Engineering (PhDME)** program is to educate graduate students in a subspecialty major of mechanical engineering, to broaden the knowledge base of the doctoral students in a minor field related to their major specialty, to educate the doctoral students in effective conduct of research recognized by a team of peers, to educate the students in presentation skills through research paper presentation and publication, and to prepare the doctoral graduates to serve the global community in research and/or education. ✓

c. The role of the program (s) and relationship to the University mission: Explain in 1-2 concise paragraphs.

The Mechanical Engineering Department's BS degree in Mechanical Engineering, MS degree in Mechanical Engineering, and PhD degree in Mechanical Engineering support the university mission and the college mission. The role of the programs is to preparing the students to:

1. Be employed in careers related to mechanical engineering including mechanical systems and design, thermo-fluids, and materials engineering in local, regional, national and global levels.
2. Pursue life-long learning, such as graduate studies and research, certification from professional organizations, FE/PE etc.
3. Achieve professional success through the programs' emphasis on experiential learning through solving real world problems.

The role and missions of the Mechanical Engineering programs are consistent and in line with those of the College of Engineering and the University's broad mission. These include preparing undergraduate and graduate students to engage effectively and responsibly in the practice of the engineering profession in a global economy. The programs are designed and geared to produce mechanical engineering graduates who can practice their profession within the metropolitan area and beyond. The mechanical engineers of the BSME program will have gained broad education that will contribute toward the development of the larger metropolitan area and the larger community of Kansas, which are also the basic mission of the university. The program also aims to impart educational and cultural tools necessary for the mechanical engineering profession in today's globalized industry.

d. Has the mission of the Program (s) changed since last review? ☐ Yes ☒ No

If yes, describe in 1-2 concise paragraphs. If no, is there a need to change?

e. Provide an overall description of your program (s) including a list of the measurable goals and objectives of the program (s) (both programmatic and learner centered).

The **Bachelor of Science in Mechanical Engineering (BSME)** program equips graduates with engineering methods, skills, and experience required to design, to develop, and to produce mechanical components or systems in any industry. The program prepares students for job responsibilities through a broad course of study that covers the basic math and sciences, general education courses, mechanical engineering major required courses, as well as the ethical, professional, and communication skills needed to be successful as a practicing mechanical engineer.

The *Program Educational Objectives (PEO)* of the BS in Mechanical Engineering (BSME) program, as adopted by its constituents in fall 2006 and currently followed by the program, are as follows:

1. Educate students to be successful mechanical engineers in their professions in a global environment,
2. Prepare students to pursue life-long learning,
3. Prepare students for real-world problems by working on industry-based projects.

The effectiveness of the BSME programs is assessed in line with the Accreditation Board for Engineering and Technology (ABET) requirements through extensive assessment techniques involving course and project evaluation, capstone course evaluation by industry liaison, and comprehensive curriculum assessment. The results are evaluated by the faculty periodically and corrective measures are implemented to continuously improve the program. The details of the BSME program assessment is provided in Appendix A.

The **Master of Science in Mechanical engineering (MSME)** degree program prepares students for engineering practice and research in the areas of materials engineering, thermo-fluid sciences, and mechanical systems analysis and design. Students can complete the degree requirement through any of the following options: thesis, directed project, or all coursework.

The *Program Educational Objectives (PEO)* of the MS in Mechanical Engineering (MSME) program, are as follows:

1. Prepare graduate students for employment and careers in mechanical engineering profession and advancement in their field,

Please show that this is done.

2. Ensure that graduates have the technical knowledge and academic background necessary to be accepted to other advanced degree program, such as a doctoral of philosophy in mechanical engineering.

The Master program (MSME) is assessed through a set of learner outcomes related to competency in core areas, design skills, effective communication, engineering ethics, and ability to self-educate. The course work evaluation, course project effectiveness, and thesis/project work are all part of this assessment. Program effectiveness is gauged by the papers presented by the students at regional and national conferences, including annual graduate school GRASP presentation. The details of the MSME program assessment is provided in Appendix B.

The **Doctor of Philosophy in Mechanical Engineering (PhDME)** program is directed towards educating students to perform research and advance the knowledge in one of the areas of materials engineering, thermo-fluid sciences, and mechanical systems and design. Students complete the degree requirements through an extensive array of advanced mechanical engineering courses in their major and minor fields, qualifying/preliminary exams, research proposal design, and successful completion and defense of their doctoral dissertation research.

The *Program Educational Objectives (PEO)* of the PhD in Mechanical Engineering (PhDME) program are as follows:

1. Prepare graduate students for advanced careers in mechanical engineering profession and advancement in their field.
2. Ensure that graduates have the technical knowledge, professional and research skills for employment in research and/or academic positions.

The Doctoral program (PhDME) is assessed through a set of learner outcomes related to competency in core areas, design skills, effective communication, engineering ethics, and ability to self-educate and to conduct independent scholarly research. Project-based courses, research practice, participation and presentation of research results at conferences, and papers submitted to journals and peer examination of doctoral students are all parts of the program assessment. The details of the PhDME program assessment is provided in Appendix C.

- f. Have they changed since the last review?

☐ Yes ☒ No

If yes, describe the changes in a concise manner.

2a. Describe the quality of the program as assessed by the strengths, productivity, and qualifications of the faculty in terms of SCH, majors, graduates and scholarly productivity (refer to instructions in the WSU Program Review document for more information on completing this section). Complete a separate table for each program if appropriate.

UG Program - BSME (SCH from entire department)

Last 3 Years	Tenure/Tenure Track Faculty (Number)		Tenure/Tenure Track Faculty with Terminal Degree (Number)		Instructional FTE (#): TTF= Tenure/Tenure Track GTA=Grad teaching assist O=Other instructional FTE			Total SCH - Total SCH by FY from Su, Fl, Sp	Total Majors - From fall semester	Total Grads – by FY							
					TTF	GTA	O										
Year 1→	8		8		10.7	4	1	6355	227	59							
Year 2→	8		7		9.0	0	0.8	6777	249	62							
Year 3→																	
Total Number Instructional (FTE) – TTF+GTA+O								SCH/ FTE	Majors/ FTE	Grads/ FTE							
Year 1→							10.8	588	21	5							
Year 2→							9.8	692	25	6							
Year 3→																	
Scholarly Productivity	Number Journal Articles		Number Presentations		Number Conference Proceedings		Performances			Number Contract Reports		Graduate Supervision Completed		No. Books	No. Book Chaps	No. Grants Awarded	\$ Grant Value
	Ref	Non-Ref	Ref	Non-Ref	Ref	Non-Ref	*	**	***	Juried	****	MS	PhD				
Year 1 (2009)	9		3		29					5		7	2		1	10	\$2,712,433
Year 2 (2010)	17		13		33					11		21	5		1	7	\$1,380,293
Year 3 (2011)	35		18		45					18		37	3		2	16	\$2,526,433

* Winning by competitive audition. **Professional attainment (e.g., commercial recording). ***Principal role in a performance. ****Commissioned or included in a collection. KBOR data minima for UG programs: Majors=25; Graduates=10; Faculty=3; KBOR data minima for master programs: Majors=20; Graduates=5; Faculty=3 additional; KBOR data minima for doctoral programs: Majors=5; Graduates=2; Faculty=2 additional.

- a. Provide a brief assessment of the quality of the faculty/staff using the data from the table above as well as any additional relevant data. Programs should comment on details in regard to productivity of the faculty (i.e., some departments may have a few faculty producing the majority of the scholarship), efforts to recruit/retain faculty, departmental succession plans, course evaluation data, etc.

The Mechanical Engineering faculty has been active in all phases of teaching/instruction, scholarly activity/ research, and service.

In terms of instruction/teaching, the department faculty have been adapting well to the surge in the number of students enrolled in the programs, especially in the undergraduate BSME program, despite the loss or shortage of faculty. The number of freshmen/sophomore enrolled in the BSME has grown from 91 to 140 from fall 2005 to fall 2010, a 53% increase in the number of students. During that same time period, the number of student credit hours (SCH) production per semester has grown from 1775 to 2988, a 68 percent increase. The average SCH per tenured faculty per semester has increased from 124 to 295, more than doubled during that time. The number of BSME awarded annually has more than doubled from 32 to 71 from FY2006 to FY2011. The number of graduate students enrolled in the MSME and PhDME during that same period has remained nearly steady. The number of MS and PhD graduates though has seen a surge during the last two years. Despite the reduction

in the number of tenured and tenure-track faculty from 11 to 7 during that same period, the department has maintained effective teaching and instruction. The teaching laboratories have been expanded and new lab safety measures have been implemented. More emphasis has also been placed on the experience-based learning and engagement of the students with the mechanical design and development process. The ME faculty have won awards and recognition for their excellent teaching and instruction from the College of Engineering as well as from the University. These awards include the COE Wallace Excellence in Teaching award, the University Academy for Effective Teaching award, and the nationwide SAE Ralph R. Teetor Outstanding Educator award.

With regards to scholarly activity and research, the department has seen a tremendous growth in the number of referred journal publications, reviewed conference proceedings, and funded research. The ME faculty published 9, 17, and 36 refereed journal papers in 2009, 2010, and 2011 respectively, probably one of the highest on campus. The ME faculty also published 29, 33 and 45 reviewed conference proceedings in 2009, 2010, and 2011 respectively. They were also quite active in producing other technical papers, contact reports, and presentations without proceedings. While some faculty members have published more than others, other faculty members have focused more on research grants. The ME faculty were granted funding for 10, 7, and 16 research proposals, for a total over \$2M funding on average annually. The faculty also produced funding for students support, and engaged both undergraduate and graduate students in their research activities. Overall, the ME faculty have continued to increase the number of refereed journal papers, reviewed conference papers, the number of funded research proposals, and amount of money generated through funded research, while maintaining steady the amount of funding to students. The ME faculty have won university and national awards for their significant contributions to research and scholarly activities. These include the Wallace Excellence in Research award, the University Young Faculty Scholar award, and the University Excellence in Research award, Boeing fellowship, Bombardier/Learjet fellowship, NIAR fellowship, etc.

In term of service activities, the ME faculty actively serve on a number of departmental, college, and university committees. The ME faculty also makes invaluable service contributions to the profession and the community. They review many technical papers and proposals for archival journal/conference publications and for funding by federal agencies. The faculty chair and organize technical sessions in national conferences/symposia or meetings. The ME faculty members serve on the National Technical Committees of professional organizations such as the American Society of Mechanical Engineers (ASME), are members of the editorial boards or advisory panels for international journals, serve as editors or associate editors for several international journals, and are recognized for their continuous professional service by engineering professional organizations. One faculty member has been granted with "fellow" by the ASME, one of the 3 fellows in the entire College of Engineering. The ME faculty are also active and act as advisor for Students Sections of professional societies, such as the ASME, Pi Tau Sigma, Tau Beta Pi, SAE Mini Baja, ~~SAE Formula One~~ and ASHRAE.

2b. Describe the quality of the program as assessed by the strengths, productivity, and qualifications of the faculty in terms of SCH, majors, graduates and scholarly productivity (refer to instructions in the WSU Program Review document for more information on completing this section). Complete a separate table for each program if appropriate.

MS-ME Program

Last 3 Years			Tenure/Tenure Track Faculty (Number)		Tenure/Tenure Track Faculty with Terminal Degree (Number)		Instructional FTE (#): TTF= Tenure/Tenure Track GTA=Grad teaching assist O=Other instructional FTE				Total SCH - Total SCH by FY from Su, Fl, Sp		Total Majors - From fall semester		Total Grads – by FY				
							TTF		GTA		O								
Year 1→			*		*		*		*		*		N/A		84		25		
Year 2→			*		*		*		*		*		N/A		93		18		
Year 3→			*		*		*		*		*								
Total Number Instructional (FTE) – TTF+GTA+O												SCH/ FTE		Majors/ FTE		Grads/ FTE			
Year 1→												N/A		N/A		N/A		N/A	
Year 2→												N/A		N/A		N/A		N/A	
Year 3→												N/A		N/A		N/A		N/A	
Scholarly Productivity		Number Journal Articles		Number Presentations		Number Conference Proceedings		Performances			Number Contract Reports		Graduate Supervision Completed		No. Books	No. Book Chaps	No. Grants Awarded	\$ Grant Value	
		Ref	Non-Ref	Ref	Non-Ref	Ref	Non-Ref	*	**	***	Juried	****	MS	PhD					
		Year 1 (2009)	9		3		29				5		7	2		1	10	\$2,712,979	
		Year 2 (2010)	17		13		33				11		21	5		1	7	\$1,380,293	
		Year 3 (2011)	35		18		45				18		37	3		2	16	\$2,526,433	

* Winning by competitive audition. **Professional attainment (e.g., commercial recording). ***Principal role in a performance. ****Commissioned or included in a collection. KBOR data minima for UG programs: Majors=25; Graduates=10; Faculty=3; KBOR data minima for master programs: Majors=20; Graduates=5; Faculty=3 additional; KBOR data minima for doctoral programs: Majors=5; Graduates=2; Faculty=2 additional.

*From the table on page 3, indicate number of faculty (and instructional FTE) teaching in the graduate program.

- a. Provide a brief assessment of the quality of the faculty/staff using the data from the table above as well as any additional relevant data. Programs should comment on details in regard to productivity of the faculty (i.e., some departments may have a few faculty producing the majority of the scholarship), efforts to recruit/retain faculty, departmental succession plans, course evaluation data, etc.

Please refer to overall departmental faculty assessment under 2a.

2c. Describe the quality of the program as assessed by the strengths, productivity, and qualifications of the faculty in terms of SCH, majors, graduates and scholarly productivity (refer to instructions in the WSU Program Review document for more information on completing this section). Complete a separate table for each program if appropriate.

PhD-ME Program

Last 3 Years	Tenure/Tenure Track Faculty (Number)	Tenure/Tenure Track Faculty with Terminal Degree (Number)	Instructional FTE (#): TTF= Tenure/Tenure Track GTA=Grad teaching assist O=Other instructional FTE			Total SCH - Total SCH by FY from Su, Fl, Sp	Total Majors - From fall semester	Total Grads – by FY									
			TTF	GTA	O												
Year 1→	*	*	*	*	*	N/A	19	2									
Year 2→	*	*	*	*	*	N/A	20	3									
Year 3→	*	*	*	*	*												
Total Number Instructional (FTE) – TTF+GTA+O						SCH/ FTE	Majors/ FTE	Grads/ FTE									
↓																	
Year 1→					N/A	N/A	N/A	N/A									
Year 2→					N/A	N/A	N/A	N/A									
Year 3→					N/A	N/A	N/A	N/A									
Scholarly Productivity	Number Journal Articles		Number Presentations		Number Conference Proceedings		Performances			No. Contract Reports		Graduate Supervision Completed		No. Books	No. Book Chaps	No. Grants Awarded	\$ Grant Value
	Ref	Non- Ref	Ref	Non- Ref	Ref	Non- Ref	*	**	***	Juried	****	MS	PhD				
	Year 1 (2009)	9		3		29				5		7	2		1	10	\$2,712,979
Year 2 (2010)	17		13		33				11		21	5		1	7	\$1,380,293	
Year 3 (2011)	35		18		45				18		37	3		2	16	\$2,526,433	

* Winning by competitive audition. **Professional attainment (e.g., commercial recording). ***Principal role in a performance. ****Commissioned or included in a collection. KBOR data minima for UG programs: Majors=25; Graduates=10; Faculty=3; KBOR data minima for master programs: Majors=20; Graduates=5; Faculty=3 additional; KBOR data minima for doctoral programs: Majors=5; Graduates=2; Faculty=2 additional.

*From the table on page 3, indicate number of faculty (and instructional FTE) teaching in the graduate program.

- a. Provide a brief assessment of the quality of the faculty/staff using the data from the table above as well as any additional relevant data. Programs should comment on details in regard to productivity of the faculty (i.e., some departments may have a few faculty producing the majority of the scholarship), efforts to recruit/retain faculty, departmental succession plans, course evaluation data, etc.

Please refer to overall departmental faculty assessment under 2a.

3. Academic Program: Analyze the quality of the program as assessed by its curriculum and impact on students. Complete this section for each program (if more than one). Attach updated program assessment plan (s) as an appendix (refer to instructions in the WSU Program Review document for more information).

- a. For undergraduate programs, compare ACT scores of the majors with the University as a whole.

Last 3 Years	Total Majors - From fall semester	ACT – Fall Semester (mean for those reporting)	
		Majors	All University Students - FT
Year 1→	227	22.7	22.66
Year 2→	249	22.8	22.72
Year 3→			22.81

KBOR data minima for UG programs: ACT \leq 20 will trigger program.

- b. For graduate programs, compare graduate GPAs of the majors with University graduate GPAs.*

Last 3 Years	Total Admitted - By FY		Average GPA (Admitted) – Domestic Students Only (60 hr GPA for those with \geq 54 hr reported) By FY					
	MS	PhD			Comparisons			
	MS	PhD	MS GPA	PhD GPA	College – MS	College – PhD	Univ - MS	Univ PhD
Year 1→08	95	17	3.54	3.33	3.33	3.51	3.48	3.62
Year 2→09	85	18	3.41	3.43	3.36	3.57	3.48	3.62
Year 3→10	59	18	3.42	3.68	3.40	3.60	3.48	3.67

*If your admission process uses another GPA calculation, revise table to suit program needs and enter your internally collected data.

- c. Identify the principal learning outcomes (i.e., what skills does your Program expect students to graduate with). Provide aggregate data on how students are meeting those outcomes. Data should relate to the goals and objectives of the program as listed in 1e. Provide an analysis and evaluation of the data by learner outcome with proposed actions based on the results.

In the following table provide program level information. You may add an appendix to provide more explanation/details. Definitions:

Learning Outcomes: Learning outcomes are statements that describe what students are expected to know and be able to do by the time of graduation. These relate to the skills, knowledge, and behaviors that students acquire in their matriculation through the program (e.g., graduates will demonstrate advanced writing ability).

Assessment Tool: One or more tools to identify, collect, and prepare data to evaluate the achievement of learning outcomes (e.g., a writing project evaluated by a rubric).

Criterion/Target: Percentage of program students expected to achieve the desired outcome for demonstrating program effectiveness (e.g., 90% of the students will demonstrate satisfactory performance on a writing project).

Result: Actual achievement on each learning outcome measurement (e.g., 95%).

Analysis: Determines the extent to which learning outcomes are being achieved and leads to decisions and actions to improve the program. The analysis and evaluation should align with specific learning outcome and consider whether the measurement and/or criteria/target remain a valid indicator of the learning outcome as well as whether the learning outcomes need to be revised.

The assessment of the learner outcomes for the BSME, MSME and PhDME programs are shown in the following three tables. The details of each program assessment are provided in the Appendices A, B, and C.

BSME Assessment Criteria (see **Appendix A** for Detailed Assessment Plan)

Learning Outcome	Assessment Tool	Target/Criterion	Latest Result
BSME graduates will attain: (a) An ability to apply knowledge of mathematics, science, and engineering.	➤ ME Senior Exit Exam ➤ ME Senior Exit Survey, Amount of Learning	33% (50%)* 3.0/5.0	50.4% 3.68/5.0
BSME graduates will attain: (b) An ability to design and conduct experiments, as well as to analyze and interpret data.	➤ Capstone Industry Project Score	80%	95.2%
BSME graduates will attain: (c) An ability to design a system, component, or process to meet desired needs.	➤ Capstone Industry Project Score ➤ Capstone Design: Industry Project Qualitative Feedback	85% 100% Positive Feedback	95.2% 100%
BSME graduates will attain: (d) An ability to function on a multidisciplinary team.	➤ Capstone Design: Team Member Peer Evaluations	85%	90.4%
BSME graduates will attain: (e) An ability to identify, formulate, and solve engineering problems.	➤ Capstone Industry Project Score	85%	95.2%
BSME graduates will attain: (f) Understanding of professional and ethical responsibility.	➤ Capstone Design: Team Member Peer Evaluations ➤ Capstone Design: Industry Project Qualitative Feedback	85% 100% Positive Feedback	90.4% 100%
BSME graduates will attain: (g) An ability to communicate effectively.	➤ Capstone Design: Team Member Peer Evaluations ➤ Capstone Design: Industry Project Qualitative Feedback	85% 100% Positive Feedback	90.4% 100%
BSME graduates will attain: (h) The broad education necessary to understand the impact of engineering solutions in a global and social context.	➤ ME Senior Exit Survey, Amount Learning ➤ Engineering 2020 Completion Rate	3.0/5.0 100%	3.7/5.0 100%
BSME graduates will attain: (i) A recognition of the need for, and an ability to engage in, life-long learning.	➤ ME Senior Chair Survey <i>I know how not to be done!!</i>	3.0/5.0	4.3/5.0
BSME graduates will attain: (j) A knowledge of contemporary issues.	➤ Engineering 2020 Completion Rate	100%	100%
BSME graduates will attain: (k) An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.	➤ Capstone Industry Project Score ➤ Capstone Design: Industry Project Qualitative Feedback ➤ ME Senior Exit Survey, Amount Learning	85% 100% Positive Feedback 3.0/5.0	95.2% 100% 3.7/5.0

* The first number corresponds to the average passing score from the University of Oklahoma simulated on-line FE Exams. The second number in parentheses is the target set by the BSME program at WSU. The targets and data assessment for the undergraduate programs will be further evaluated and modified after the ABET report is prepared in 2012-2013. The results will be reported in the next cycle. The latest results correspond to the 2011 and 2011 and 2012 data utilizing all the listed assessment tools.

Explanation for missing data: No data is missing.

MSME Assessment Criteria (see **Appendix B** for Detailed Assessment Plan)

Learner Outcome	Assessment Tool	Target/Criterion	Result*
(a) MSME graduates will have an ability to self-educate	➤ Research projects in courses	80%	N/A
(b) MSME graduates will have effective communication skills.	➤ Writing skills - via assignments and projects in the required technical writing class CESP750D; and graduate level courses that have writing component ➤ Presentation skills - via graduate level courses that have presentation component	80%	N/A
(c) MSME graduates will have competency in core areas of materials engineering, thermo-fluid sciences, and mechanical systems and design..	➤ Graduates will be assessed for several course learner outcomes while taking the core classes in materials engineering, thermo-fluid sciences, and mechanical systems and design. ➤ Graduates will be assessed via prerequisite quizzes in the classes which utilize the concepts developed in the core classes.	80%	N/A
(d) MSME graduates will be able to design and improve systems, components, or processes to meet desired needs.	➤ Graduates will be assessed for course learner outcomes while taking classes which emphasize design and improvement of engineering systems.	80%	N/A
(e) MSME graduates will have a knowledge of professional and ethical responsibility.	➤ Graduate students will be assessed using CITI integrity modules with average scores reported.	80%	N/A

*Explanation for missing data: This is the first year that the ME Department will be assessing the MS graduate program using the new criteria. The results will be reported in the next cycle.

PhD Assessment Criteria (see **Appendix C** for Detailed Assessment Plan)

Learner Outcome	Assessment Tool	Target/Criterion	Result
(a) PhDME graduates will have an ability to self-educate and to conduct independent scholarly research.	<ul style="list-style-type: none"> ➤ Rubric score on dissertation ➤ Research projects in courses 	80%	N/A
(b) PhDME graduates will have effective oral and written communication skills.	<ul style="list-style-type: none"> ➤ Writing skills via assignments and projects in the required technical writing class CESP750D; graduate level courses that have writing component; and dissertation ➤ Presentation skills via graduate level courses that have presentation component; and dissertation defense 	80%	N/A
(c) PhDME graduates will have competency in one of the core, as well as their major and minor areas.	<ul style="list-style-type: none"> ➤ Average scores from qualifying exam. Will require dissertation chair to report a numerical score; ➤ Graduates will be assessed via prerequisite quizzes in the classes which utilize the concepts developed in the core classes. 	85%	N/A
(d) PhDME graduates will be able to design and improve systems, components, or processes to meet desired needs.	<ul style="list-style-type: none"> ➤ Graduates will be assessed for course learner outcomes while taking classes which emphasize design and improvement of engineering systems. 	80%	N/A
(e) PhDME graduates will have a knowledge of professional and ethical responsibility.	<ul style="list-style-type: none"> ➤ Graduate students will be assessed using CITI integrity modules with average scores reported 	80%	N/A

*Explanation for missing data: This is the first year that the ME Department will be assessing the PhD graduate program using the new criteria. The results will be reported in the next cycle.

- d. Provide aggregate data on student majors satisfaction (e.g., exit surveys), capstone results, licensing or certification examination results, employer surveys or other such data that indicate student satisfaction with the program and whether students are learning the curriculum (for learner outcomes, data should relate to the goals and objectives of the program as listed in 1e).

Student Satisfaction (e.g., exit survey data on overall program satisfaction). [*] If available, report by year, for the last 3 years			Learner Outcomes (e.g., capstone, licensing/certification exam pass-rates) by year, for the last three years				
Year	N	Result (e.g., 4.5 on scale of 1-5, where 5 highest)	Year	N	Name of Exam	Program Result	National Comparison [±]
1 (2009)		Senior Exit Survey on ME Curriculum (see Table below)	1 (2009)		Capstone	47.1%	N/A
2 (2010)		Senior Exit Survey on ME Curriculum (see Table below)	2 (2010)		Capstone	47.7%	N/A
3 (2011)		Senior Exit Survey on ME Curriculum (see Table below)	3 (2011)		Capstone	50.4%	33%

^{*}Available for graduate programs from the Graduate School Exit Survey. Undergraduate programs should collect internally.

[±] The ME Exit Exam consists of sixty questions from 13 Mechanical Engineering topic areas, covering both the morning and afternoon subject areas of the FE license exam. Each question is allotted 3 minutes, the same time allotted in the FE exam. The National Comparison average score was taken from University of Oklahoma simulated on-line FE Exam Scores for the last 10 student attempts.

BSME Program:

Grand Average Senior Exit Survey on BSME Curriculum (out of 5 points total)					
Semester	# Surveys	Amount Learning	Quality of Instruction	Program Workload	Program Value
FL 11	29	3.66	3.55	3.07	3.02
SP 12	34	3.68	3.55	3.13	3.12

A number of other data are collected in the assessment of the undergraduate BSME program. These include:

- ME Senior Exit Program Survey
- ME Senior Chair Survey
- ME Senior Exit Exam
- Capstone Design: Team Member Peer Evaluations
- Capstone Design: Industry Project Survey
- Capstone Design: Industry Project Score
- Engineering 2020 Completion Rate

The data for perception of ME core courses are collected each semester in the capstone class. The data for the undergraduate core competencies are obtained from ME Senior Exit Exam. The data for learner outcomes shall be measured and assessed in every course by the faculty starting Fall 2012. However, a set of these are mapped to the program level. The mapped set is used for assessment of the program.

MSME and PhDME Programs:

For the graduate programs data collection and analysis are missing because this is the first year that the ME Department shall be assessing the graduate programs using the new criteria. However, graduate students have been active in journal paper writing, conference paper writing and presentation, as shown in the Table below.

Publications with Graduate Students	2009	2010	2011
Graduate Student Co-Authored Journal Publications	8	17	33
Graduate Student Co-Authored Conference Publications	27	33	44

As the ME Department will be assessing the MS graduate program using the new criteria, no data is currently available for the student satisfaction with the graduate programs. This data shall be collected and reported in the next cycle.

- e. Provide aggregate data on how the goals of the *WSU General Education Program* and *KBOR 2020 Foundation Skills* are assessed in undergraduate programs (optional for graduate programs).

Goals/Skills Measurements of: -Oral and written communication -Numerical literacy -Critical thinking and problem solving -Collaboration and teamwork -Library research skills -Diversity and globalization	Results	
	Majors	Non-Majors

Note: Not all programs evaluate every goal/skill. Programs may choose to use assessment rubrics for this purpose. Sample forms available at:
<http://www.aacu.org/value/rubrics/>

Currently, these skills are measured through evaluation in Mechanical Engineering courses. Please refer to Tables A.2 and A.3 in Appendix A for the mapping of ABET criteria to the courses.

Oral and written communication skills shall be measured through data collected in courses for ABET criterion (g) - "Ability to communicate".

Numerical literacy shall be measured through ABET criterion (a) - "Ability to apply math and science" in almost all the junior and senior level ME courses, but mainly in the ME533 (Mechanical Engineering Laboratory), ME 633 (Mechanical Systems Laboratory), ME 662 (ME Senior Capstone), the ME Design Electives, and the ME Thermal Design elective courses.

Critical thinking and problem solving shall be measured through three criteria in ABET: "Ability to design and conduct experiments" - criterion (b), "Ability to design systems and components" - criterion (c), and "Ability to solve engineering problems" - criterion (e).

Collaboration and team work shall be measured through ABET criterion (d) - "Ability to function on teams".

Library research skills: The data for library and research skills are not collected currently. However, there are several courses in which students perform independent research as part of the class and data from these courses can be used for assessing library research skills.

Diversity and globalization: Globalization shall be measured through ABET criterion (g) - "Ability to understand global and societal context. Diversity in discipline and culture are addressed by analyzing data from the College Engineering 2020 as well.

In addition to the above data, Collegiate Learning Assessment (CLA) will be started from the fall semester of 2012. This will be used for collecting data for the next reporting cycle. The students will be tested at the beginning of their education at Wichita State University and they will also be tested when they graduate to determine the outcomes gained through the students' educational experience. The assessment is used, in conjunction with Program Review, to verify the University's impact on the outcomes as well as to contribute to continuous improvement of the University's programs.

- f. Indicate whether the program is accredited by a specialty accrediting body including the next review date and concerns from the last review.

The Bachelor of Science in Mechanical Engineering program is accredited by ABET. At the time of last review in Fall 2007, no concern was indicated by the accreditation agency.

- g. Provide a brief assessment of the overall quality of the academic program using the data from 3a – 3f and other information you may collect, including outstanding student work (e.g., outstanding scholarship, inductions into honor organizations, publications, special awards, academic scholarships, student recruitment and retention).

The average ACT score for the BSME (22.8) program is almost the same as the university average (22.6). The number of students in the BSME has grown significantly since the last review to over 400. The number of BSME granted degree has also increased significantly to about 90 students per year. In terms of enrollment, the MSME program has seen a small reduction last year, but the PhD program has remained steady.

The undergraduate program in Mechanical Engineering is regularly assessed through the use of prerequisite assessment in courses and by collecting data on learner outcomes. Core competency exams and satisfaction with core courses are assessed each year. The undergraduate students are involved in activities such as the Society of Automotive Engineers (SAE) Mini Baja and Formula. The teams of students from WSU compete regularly in the regional and national competitions, and are usually placed in the event. The ME undergraduate students have also started to present papers in the new undergraduate research forum. The undergraduate students participate in at least one COE Open House project presentation, or other forum, before they graduate.

For the graduate programs, all course syllabuses will be changed to include learner outcomes in Fall 2012. A preliminary plan of the course outcomes are provided in the Appendices B and C for the graduate MS and PhD programs. Thus the majority of data that are available is for the undergraduate BSME program. More data will be available for the graduate level program by the next reporting period. The graduate students with their advisors have published nearly 20 refereed journal articles and 35 reviewed conference proceeding papers per year in the last three years. Almost all journal papers and conference proceeding papers published by the faculty have at least one student co-author. In addition, they present papers at scientific regional, national, and international conferences (27, 33, and 44 conference paper presentations with at least one student author in 2009, 2010, and 2011 respectively), and participate actively in the open house projects. Overall, the programs offered by the Mechanical Engineering Department have a sound curriculum.

4a. Analyze the student need and employer demand for the program. Complete for each program if appropriate (refer to instructions in the WSU Program Review document for more information on completing this section).

- a. Utilize the table below to provide data that demonstrates student need and demand for the program.

Undergraduate - BSME

Majors						Employment of Majors*						No. pursuing graduate or profes- sional educa- tion	Projected growth from BLS**							
Last 3 FYs – Su, FI, and Sp	No. new appli- cants or declared majors	No. who enter or are admit- ted in the major	No. enroll- ed one year later	1 Year Attri- tion %	Total no. of grads	Average Starting Salary	Employ- ment % In state	Employment % in the field	Employment: % related to the field	Employment: % outside the field										
Year 1→		86	47	54.7%	59	\$62,500						Current year only ↓								
Year 2→		70	36	51.4%	62	\$57,500														
Year 3→		73	44	60.3%																
Race/Ethnicity by Major***											Race/Ethnicity by Graduate***									
		NRA	H	A I / A N	A	B	N H / PI	C	MR	UNK	NRA	H	A I / A N	A	B	N H / PI	C	MR	UNK	
Year 1→		37	3	1	43	2	0	129	0	12	11	2	0	6	0	0	38	0	2	
Year 2→		36	5	2	58	2	0	131	0	15	10	0	0	18	0	0	29	0	5	
Year 3→																				

* May not be collected every year

** Go to the U.S. Bureau of Labor Statistics Website: <http://www.bls.gov/oco/> and view job outlook data and salary information (if the Program has information available from professional associations or alumni surveys, enter that data)

*** NRA=Non-resident alien; H=Hispanic; AI/AN=American Indian/ Alaskan Native; A=Asian; B=Black; NH/PI=Native Hawaiian/Pacific Islander; C=Caucasian; MR=Multi-race; UNK=Unknown

KBOR data minima for UG programs: Majors=25; Graduates=10; Faculty=3; KBOR data minima for master programs: Majors=20; Graduates=5; Faculty=3 additional; KBOR data minima for doctoral programs: Majors=5; Graduates=2; Faculty=2 additional.

Provide a brief assessment of student need and demand using the data from the table above. Include the most common types of positions, in terms of employment, graduates can expect to find.

According to the US Bureau of Labor Statistics, in May 2011, the median annual wage of mechanical engineers in the US was \$83,550 (\$73,480 in the State of Kansas). There were over 238,000 mechanical engineering positions in the US in May 2011 (over 2000 in Kansas), a rise of nearly 1.8 percent since last year. Overall, there were 1.59 jobs as mechanical engineers per 1000 employments. The growth rate in mechanical engineering jobs from 2010-2020 is anticipated to be around the national average for all engineering jobs of 6 percent. Overall, there is a healthy demand for the employment of mechanical engineering graduates in the Wichita Metro, State of Kansas, and the nation. Hence, the presence of a strong and vibrant Mechanical Engineering programs is vital to the economy of the metropolitan Wichita, State of Kansas, and the US.

At the Wichita State University, the annual enrollment for the BSME program has grown by over 53 percent during the last six years, while the student credit hour production has seen a nearly 68 percent increase. The number of BSME degrees annually awarded at WSU has nearly doubled during that same period.

Graduates of the BS program in Mechanical Engineering typically find jobs as mechanical engineers, design engineers, stress engineers, systems engineers, manufacturing engineer, etc. A BSME degree is one of the most versatile engineering degrees and is of high demand in almost any segment or sector of the various industries. One advantage of this is that the BSME graduates are not susceptible to gyrations in employment in one industry sector, and the BSME graduates can easily move or find jobs in different sectors. Most of the WSU BSME graduates find jobs in Wichita and work for companies such as Spirit Aero-systems, Hawker-Beechcraft, Cessna, Bombardier-Learjet, Case New-Holland, AGCO, Siemens, etc. In the Wichita metro area, there are more mechanical engineers employed in the aerospace companies than aerospace engineers. Graduates who have left Kansas have found employment in variety of different industries, including the automotive, agricultural, aerospace, oil and gas, transportation, manufacturing, electronics, computers, etc.

4b. Analyze the student need and employer demand for the program. Complete for each program if appropriate (refer to instructions in the WSU Program Review document for more information on completing this section).

- a. Utilize the table below to provide data that demonstrates student need and demand for the program.

Graduate - MSME

Majors						Employment of Majors*								No. pursuing graduate or profes- sional educa- tion	Projected growth from BLS**					
Last 3 FYs – Su, Fl, and Sp	No. new appli- cants or declared majors	No. who enter or are admit- ted in the major	No. enroll- ed one year later	1 Year Attri- tion %	Total no. of grads	Average Salary	Employ- ment % In state	Employment % in the field	Employment: % related to the field	Employment: % outside the field										
Year 1→		46	38	82.6%	25							Current year only ↓								
Year 2→		46	35	76.1%	18															
Year 3→		27	22	81.5%																
Race/Ethnicity by Major***										Race/Ethnicity by Graduate***										
		NRA	H	A I / A N	A	B	N H / PI	C	MR	UNK	NRA	H	A I / A N	A	B	N H / PI	C	MR	UNK	
	Year 1→	55	1	0	6	1	0	17	0	4	14	0	0	3	1	0	6	0	1	
	Year 2→	51	2	0	9	0	0	29	0	2	13	0	0	0	0	0	5	0	0	
	Year 3→																			

* May not be collected every year

** Go to the U.S. Bureau of Labor Statistics Website: <http://www.bls.gov/oco/> and view job outlook data and salary information (if the Program has information available from professional associations or alumni surveys, enter that data)

*** NRA=Non-resident alien; H=Hispanic; AI/AN=American Indian/ Alaskan Native; A=Asian; B=Black; NH/PI=Native Hawaiian/Pacific Islander; C=Caucasian; MR=Multi-race; UNK=Unknown

KBOR data minima for UG programs: Majors=25; Graduates=10; Faculty=3; KBOR data minima for master programs: Majors=20; Graduates=5; Faculty=3 additional; KBOR data minima for doctoral programs: Majors=5; Graduates=2; Faculty=2 additional.

Provide a brief assessment of student need and demand using the data from the table above. Include the most common types of positions, in terms of employment, graduates can expect to find.

At the Wichita State University, the annual enrollment for the MSME has remained nearly steady (about 70) during the last three years. However, the number of MSME degrees annually awarded has nearly doubled during that same period. Graduates of the MSME program in Mechanical Engineering typically find jobs as mechanical engineers, design engineers, stress engineers, systems engineers, etc. Most of the domestic students are already employed locally. Some continue as part-time or full-time graduate students pursuing a doctor of philosophy in mechanical engineering or related fields. Graduates work or find jobs for companies such as Spirit Aero-systems, Hawker-Beechcraft, Cessna, Bombardier-Learjet, Case New-Holland, AGCO, Siemens, etc. Graduates who have left Kansas have found employment in variety of different industries, including the automotive, agricultural, aerospace, oil and gas, transportation, manufacturing, etc.

4c. Analyze the student need and employer demand for the program. Complete for each program if appropriate (refer to instructions in the WSU Program Review document for more information on completing this section).

- a. Utilize the table below to provide data that demonstrates student need and demand for the program.

Graduate – PhD

Majors						Employment of Majors*								No. pursuing graduate or profes- sional educa- tion	Projected growth from BLS**					
Last 3 FYs – Su, Fl, and Sp	No. new appli- cants or declared majors	No. who enter or are admit- ted in the major	No. enroll- ed one year later	1 Year Attri- tion %	Total no. of grads	Average Salary	Employ- ment % In state	Employment % in the field	Employment: % related to the field	Employment: % outside the field										
Year 1→		12	8	66.7%	2							Current year only ↓								
Year 2→		8	7	87.5%	3															
Year 3→		8	6	75.0%																
Race/Ethnicity by Major***							Race/Ethnicity by Graduate***													
		NRA	H	A I / A N	A	B	N H / PI	C	MR	UNK	NRA	H	A I / A N	A	B	N H / PI	C	MR	UNK	
	Year 1→	14	0	1	1	1	0	1	0	1	2	0	0	0	0	0	0	0	0	
	Year 2→	16	0	1	0	0	0	3	0	0	1	0	0	1	0	0	1	0	0	
	Year 3→																			

* May not be collected every year

** Go to the U.S. Bureau of Labor Statistics Website: <http://www.bls.gov/oco/> and view job outlook data and salary information (if the Program has information available from professional associations or alumni surveys, enter that data)

*** NRA=Non-resident alien; H=Hispanic; AI/AN=American Indian/ Alaskan Native; A=Asian; B=Black; NH/PI=Native Hawaiian/Pacific Islander; C=Caucasian; MR=Multi-race; UNK=Unknown

KBOR data minima for UG programs: Majors=25; Graduates=10; Faculty=3; KBOR data minima for master programs: Majors=20; Graduates=5; Faculty=3 additional; KBOR data minima for doctoral programs: Majors=5; Graduates=2; Faculty=2 additional.

Provide a brief assessment of student need and demand using the data from the table above. Include the most common types of positions, in terms of employment, graduates can expect to find.

At the Wichita State University, the annual enrollment for the PhDME has remained nearly steady (about 18) during the last three years. The number of PhDME degrees annually awarded has also remained nearly the same during that same period. Graduates of the PhDME program in Mechanical Engineering find jobs as researchers in industry, faculty, post-docs, engineering supervisors or managers, mechanical engineers, design engineers, stress engineers, systems engineers, etc. Graduates work or find jobs in Wichita for companies such as Spirit Aero-systems, Hawker-Beechcraft, Cessna, Bombardier-Learjet, Case New-Holland, AGCO, Siemens, etc. Graduates who have left Kansas have found employment in variety of different academic and industrial settings including university professors, post-docs, and industries including the automotive, agricultural, aerospace, oil and gas, transportation, manufacturing, etc.

5. Analyze the cost of the program and service the Program provides to the discipline, other programs at the University, and beyond. Complete for each program if appropriate (refer to instructions in the WSU Program Review document for more information on completing this section).

Percentage of SCH Taken By (last 3 years)			
Fall Semester	Year 1	Year 2	Year 3
UG Majors	54.6	60.8	
Gr Majors	18.2	17.4	
Non-Majors	27.2	21.9	

- a. Provide a brief assessment of the cost and service the Program provides. Comment on percentage of SCH taken by majors and non-majors, nature of Program in terms of the service it provides to other University programs, faculty service to the institution, and beyond.

The Mechanical Engineering Department had an average SCH per faculty of 232, 306, and 295 a semester for the fall semesters of 2008, 2009, and 2010 respectively. The department's cost per SCH is on average less than \$200 per SCH. The department offers service courses to the college through the following courses: ME 398 – Thermodynamics (for all engineering majors), and ME 250 – Materials Engineering and ME 521 - Fluids Mechanics (for AE, IME, and ME majors). In addition, several other departmental courses are also taken by students from aerospace, industrial, electrical, and bioengineering.

list

How this was estimated?

6. Report on the Program's goal (s) from the last review. List the goal (s), data that may have been collected to support the goal, and the outcome. Complete for each program if appropriate (refer to instructions in the WSU Program Review document for more information on completing this section).

(For Last 3 FYs)	Goal (s)	Assessment Data Analyzed	Outcome

7. Summary and Recommendations

- a. Set forth a summary of the report including an overview evaluating the strengths and concerns. List recommendations for improvement of each Program (for departments with multiple programs) that have resulted from this report (relate recommendations back to information provided in any of the categories and to the goals and objectives of the program as listed in 1e). Identify three year goal (s) for the Program to be accomplished in time for the next review.

Strengths:

1. The department has a very large undergraduate program (over 400 students).
2. The faculty is quite productive in terms of research, publication, and service.
3. Much of the research performed by the faculty is multi-disciplinary in nature.
4. Most undergraduate students gain co-op/internship experience.
5. The faculty areas of specialty in research and teaching are diverse.
6. Students have ready access to faculty.
7. There are active student professional organizations supported by the department.
8. Every undergraduate student has experience with a industry-based capstone design project.

Weakness:

1. The department has lost 4 faculty members in the middle of expansion of the number of students in the program. Managing the nearly over 400 undergraduate and 85 graduate ME students with the remaining 7 faculty members (including the Chair) has been quite challenging.
2. Startup package and salary are limited compared to other regent universities.
3. ~~Not enough financial support exists for the PhD students for long term planning and recruitment.~~
4. There is a shortage of both teaching and research laboratory space.
5. The students do not have access to the building and the laboratory in the Engineering building during weekends, which prevents students from doing work/projects during weekends.

Not well used by the department. Using more space for storage.

Opportunities:

1. Additional funding for undergraduate engineering education could be obtained through Kansas Senate Bill #127.
2. With the improvements in the economy of the State and nation, the demand for mechanical engineering graduates will increase.
3. The local, state, and nationwide industry is implementing continuous improvement strategies which may make use of faculty research capabilities.
4. Currently, the department has the lowest number of faculty members in the college and has the capacity to fill the vacant positions.

Threats:

1. The next ABET accreditation of the BSME program might be problematic due to the significant shortage of faculty in the department and the very large student-to-faculty ratio.
2. The growth of the department's programs may be limited by a lack of teaching and research support, technician, and laboratory space.
3. The future funding for higher education in the State of Kansas could pose a threat to the adequate resources for education of engineers.

See my comment above.

Plan/Goals (To be met prior to AY 2015/2016):

1. The vacant departmental faculty positions need to be filled as quickly as possible.
2. The department plans to increase the percentage of courses taught by regular faculty.
3. The department plans to Increase/investigate inter-disciplinary academic programs and research ideas.
4. A plan is to be developed for further increasing the research funding for all faculty in the department.
5. The department plans to move to a culture of continuous assessment.
6. The plans and measures for continuous assessment will be developed and implemented.
7. New hybrid models of teaching that take advantage of online teaching will be developed.
8. The department will implement a training scheme/support for adjuncts and GTAs.

Appendix A

Detailed Assessment Plan for BS in Mechanical Engineering Program

I. Mission

The mission of the Bachelor of Science in Mechanical Engineering (BSME) program at Wichita State University is to provide students with a broad mechanical engineering education, to help advance the mechanical engineering profession, and to contributing toward the economic development of the state of Kansas.

II. Program Objectives

The *Program Educational Objectives (PEO)* of the Mechanical Engineering Program, as adopted by its constituents in fall 2006 and currently followed by the program, are as follows:

- PEO-1: Educate students to be successful mechanical engineers in their professions in a global environment.
- PEO-2: Prepare students to pursue life-long learning.
- PEO-3: Prepare students for real-world problems by working on industry-based projects.

The PEOs of the Mechanical Engineering Program are consistent with the vision and mission of the College of Engineering. Aiming to produce successful mechanical engineers in a global environment, they are in tune with the CoE's mission of producing engineers capable of working in metropolitan area industries. The primary constituents of the Mechanical Engineering Program are the faculty, students, industry, and alumni. The various types of input from the primary constituents in terms of assessment are shown in Table A.1.

Table A.1 BSME Constituents and Input

Constituent	Input
Faculty	Formal, documented discussion
Industry	Advisory committee meetings Feedback on senior project activities
Alumni	Alumni survey results Documented anecdotal information

III. (Student) Learner Program Outcomes

The Bachelor of Science in Mechanical Engineering (BSME) program requires students to attain:

- (a) An ability to apply knowledge of mathematics, science, and engineering.
- (b) An ability to design and conduct experiments, as well as to analyze and interpret data.
- (c) An ability to design a system, component, or process to meet desired needs
- (d) An ability to function on a multidisciplinary team.
- (e) An ability to identify, formulate, and solve engineering problems.
- (f) Understanding of professional and ethical responsibility.
- (g) An ability to communicate effectively.
- (h) The broad education necessary to understand the impact of engineering solutions in a global and social context.
- (i) A recognition of the need for, and an ability to engage in, life-long learning.
- (j) A knowledge of contemporary issues.
- (k) An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.

IV. Assessment of (Student) Learner Outcomes

Various assessment tools are utilized for the evaluation and assessment of the BSME program. The program development of the assessment process is shown in Figure A.1. All courses at the undergraduate level have a syllabus that identifies the learner outcomes for the course. However, not all learner outcomes are reported to the assessment team. These learning outcomes are collected by the faculty teaching the course each semester. In addition, the department has mapped specific learning outcomes to be reported to the department assessment team.

The relationship between the ME Program's three PEOs and the ME Program Outcomes is shown in Table A.2. The Program Outcomes, in turn, are satisfied primarily by the design of the mechanical engineering curriculum. Table A.3 shows how each of the required courses in the curriculum meets the outcome requirements. Program Outcomes (a) through (k) are addressed in the required classes. Some classes address multiple outcomes. Finally, the details of the assessment plan including the learner outcomes, assessment tools, targets/ criteria, and the results are shown in Table A.4.

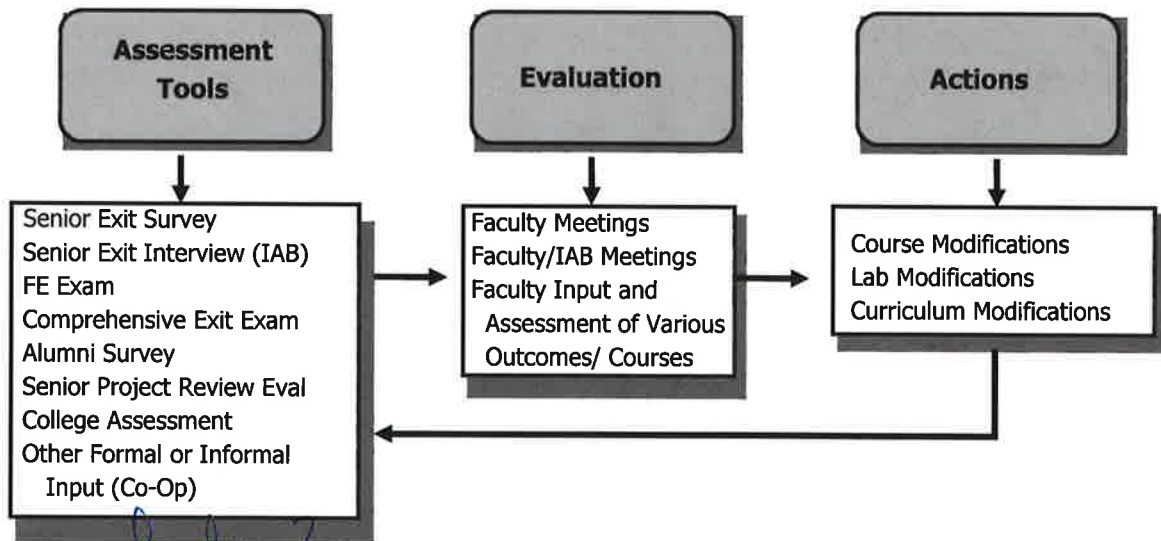


Figure A.1 Development of Assessment Process

This is the ideal model. How much of this is in place?

Table A.2 Relationship between Program Educational Objectives and ME Program Outcomes

PROGRAM EDUCATIONAL OBJECTIVES* (relating ABET Outcomes and Assessment Tools) →	PEO 1, 3	PEO 1, 2, 3	PEO 1, 3	PEO 1, 3	PEO 1, 2, 3	PEO 1, 3	PEO 1, 3	PEO 1, 3	PEO 1, 2, 3	PEO 1, 2, 3	PEO 1, 2, 3
	ME Program Outcomes: Students who complete the ME program will do the following:										
Assessment Tool Applied	a - Apply knowledge of math, science, and engineering	b - Design, conduct, and analyze experiments	c - Design a process, component, and system,	d - Work in multidisciplinary teams	e - Formulate and solve engineering problems	f - Exhibit awareness of ethical and cost issues	g - Employ good communication skills	h - Ensure impact of design on global and social issues	i - Recognize continuous learning	j - Exhibit knowledge of professional and contemporary issues	k - Use modern tools in engineering practice
Alumni Surveys	X	X	X	X	X	X	X	X	X	X	X
Course Portfolio (available during visit)	X	X	X	X	X	X	X	X	X	X	X
Senior Comprehensive Exit Exam (FE Format)	X		X		X	X					
Capstone Team Member Peer Evaluations				X		X	X				
Senior Exit Survey	X	X	X	X	X	X	X	X	X	X	
Student Exit Interviews (IAB)	X	X	X	X	X	X	X	X	X	X	X
Internship/Co-op Employer Evaluation	X	X	X	X	X	X	X	X	X	X	X

* **PEO 1:** Prepare students for employment as mechanical engineers.

PEO 2: Enable interested students to pursue graduate education.

PEO 3: Utilize the unique opportunities of a metropolitan location to provide graduates with industry based project experiences.

Table A.3 Relationship of Curriculum and Program Outcomes

Curriculum Courses/Outcomes												
➤ ABET Criterion ➔	(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)	(k)	
REQUIRED COURSES												
Communications												
COMM 111 Public Speaking							•					
ENGL 101 College English I							•					
ENGL 102 College English II							•					
Mathematics												
MATH 242 Calculus I	•											
MATH 243 Calculus II	•											
MATH 344 Calculus III	•											
MATH 555 Differential Equations I	•											
Science												
CHEM 211 General Chemistry I	•	•										
PHYS 313 University Physics I	•											
PHYS 314 University Physics II	•											
PHYS 315 University Physics Laboratory I	•	•										
Natural Science Elective	•											
Engineering Core												
AE 223 Statics	•	•										
ECE 282 Circuits I	•		•									
IME 255 Engineering Economy	•							•				
ME 398 Thermodynamics I	•		•		•						•	
Technical												
AE 333 Mechanics of Materials	•				•						•	
AE 373 Dynamics	•	•										
IME 222 Engineering Graphics	•		•								•	
ME 250 Materials Engineering	•		•	•	•		•		•		•	
ME 251 Materials Engineering Laboratory	•			•	•	•	•				•	
ME 325 Computer Applications	•		•		•						•	
ME 339 Design of Machinery	•		•		•		•				•	
ME 439 Mechanical Engineering Design I	•		•		•		•				•	
ME 502 Thermodynamics II	•				•							
ME 521 Fluid Mechanics	•		•				•					
ME 522 Heat Transfer	•		•		•		•					
ME 533 Mechanical Engineering Laboratory	•	•			•		•				•	
ME 633 Mechanical Engineering Systems Laboratory	•	•		•		•	•				•	
ME 659 Mechanical Control Systems	•		•		•						•	
ME 662 Mechanical Engineering Practice	•	•	•	•	•	•	•	•	•	•	•	
General Education												
Fine Arts								•		•		
Humanities								•		•		
Behavioral and Social Sciences								•		•		
Further Studies								•		•		
REQUIRED ELECTIVES												
ME Design (minimum one)												
ME 541 Mechanical Engineering Design II	•		•		•		•		•			
ME 637 Computer-Aided Engineering	•		•		•	•	•				•	
ME 639 Applications of Finite Element Methods in Mechanical Engineering	•		•		•		•				•	
ME 729 Computer-Aided Analysis of Mechanical Systems	•	•	•		•		•				•	
ME 737 Robotics and Control	•	•		•	•		•				•	
ME 747 Microcomputer-Based Mechanical Systems	•	•	•	•	•		•				•	
ME 750L Special Topics—Impact Dynamics	•		•		•		•				•	
Thermal Design (minimum one)												
ME 469 Energy Conversion	•	•		•		•	•				•	
ME 544 Design of HVAC Systems	•		•		•	•	•		•	•	•	

Curriculum Courses/Outcomes											
➤ ABET Criterion ➔	(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)	(k)
ME 631 Heat Exchanger Design	•		•		•	•	•		•	•	•
OTHER TECHNICAL ELECTIVES											
ME 450 Selected Topics—Creative Design and Practice			•	•		•	•	•	•	•	•
ME 664 Introduction to Fatigue and Fracture	•		•		•		•				•
ME 665 Selection of Materials for Design/ Manufacturing	•		•		•		•				•
ME 667 Mechanical Properties of Materials I	•		•		•		•				•
ME 669 Acoustics	•		•		•		•				•
ME 719 Basic Combustion Theory	•				•		•				•
ME 760 Fracture Mechanics	•		•		•			•			•
ME 762 Polymeric Composite Materials	•		•		•		•				•

Table A.4 Assessment of Learner Outcomes for the BSME Program

Learner Outcome	Assessment Tool	Target/Criterion	Latest Result
BSME graduates will attain: (a) An ability to apply knowledge of mathematics, science, and engineering.	➤ ME Senior Exit Exam ➤ ME Senior Exit Survey, Amount of Learning	33% (50%)* 3.0/5.0	50.4% 3.68/5.0
BSME graduates will attain: (b) An ability to design and conduct experiments, as well as to analyze and interpret data.	➤ Capstone Industry Project Score	80%	95.2%
BSME graduates will attain: (c) An ability to design a system, component, or process to meet desired needs.	➤ Capstone Industry Project Score ➤ Capstone Design: Industry Project Qualitative Feedback	85% 100% Positive Feedback	95.2% 100%
BSME graduates will attain: (d) An ability to function on a multidisciplinary team.	➤ Capstone Design: Team Member Peer Evaluations	85%	90.4%
BSME graduates will attain: (e) An ability to identify, formulate, and solve engineering problems.	➤ Capstone Industry Project Score	85%	95.2%
BSME graduates will attain: (f) Understanding of professional and ethical responsibility.	➤ Capstone Design: Team Member Peer Evaluations ➤ Capstone Design: Industry Project Qualitative Feedback	85% 100% Positive Feedback	90.4% 100%
BSME graduates will attain: (g) An ability to communicate effectively.	➤ Capstone Design: Team Member Peer Evaluations ➤ Capstone Design: Industry Project Qualitative Feedback	85% 100% Positive Feedback	90.4% 100%
BSME graduates will attain: (h) The broad education necessary to understand the impact of engineering solutions in a global and social context.	➤ ME Senior Exit Survey, Amount Learning ➤ Engineering 2020 Completion Rate	3.0/5.0 100%	3.7/5.0 100%

Not
Original

BSME graduates will attain: (i) A recognition of the need for, and an ability to engage in, life-long learning.	➤ ME Senior Chair Survey	3.0/5.0	4.3/5.0
BSME graduates will attain: (j) A knowledge of contemporary issues.	➤ Engineering 2020 Completion Rate	100%	100%
BSME graduates will attain: (k) An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.	➤ Capstone Industry Project Score ➤ Capstone Design: Industry Project Qualitative Feedback ➤ ME Senior Exit Survey, Amount Learning	85% 100% Positive Feedback 3.0/5.0	95.2% 100% 3.7/5.0

V. Feedback Loop

- Prerequisite tests are collected each semester along with the assessment report by the faculty teaching the course. The results of the prerequisite assessment are provided to the faculty teaching the prerequisite course. Corrective actions are taken by the faculty.
- The departmental curriculum committee reviews the outcomes and requirements every two years and recommends changes. The assessment is reported back to the faculty.

A diagram of the overall assessment process is shown in Figure A.2, which outlines the various processes and tools employed in assessing the PEOs in conjunction with the program criteria. The PEOs guide the constant evolution of program curriculum. Assessment tools developed over the period have helped in assessing the program criteria and, by extension, the PEOs.

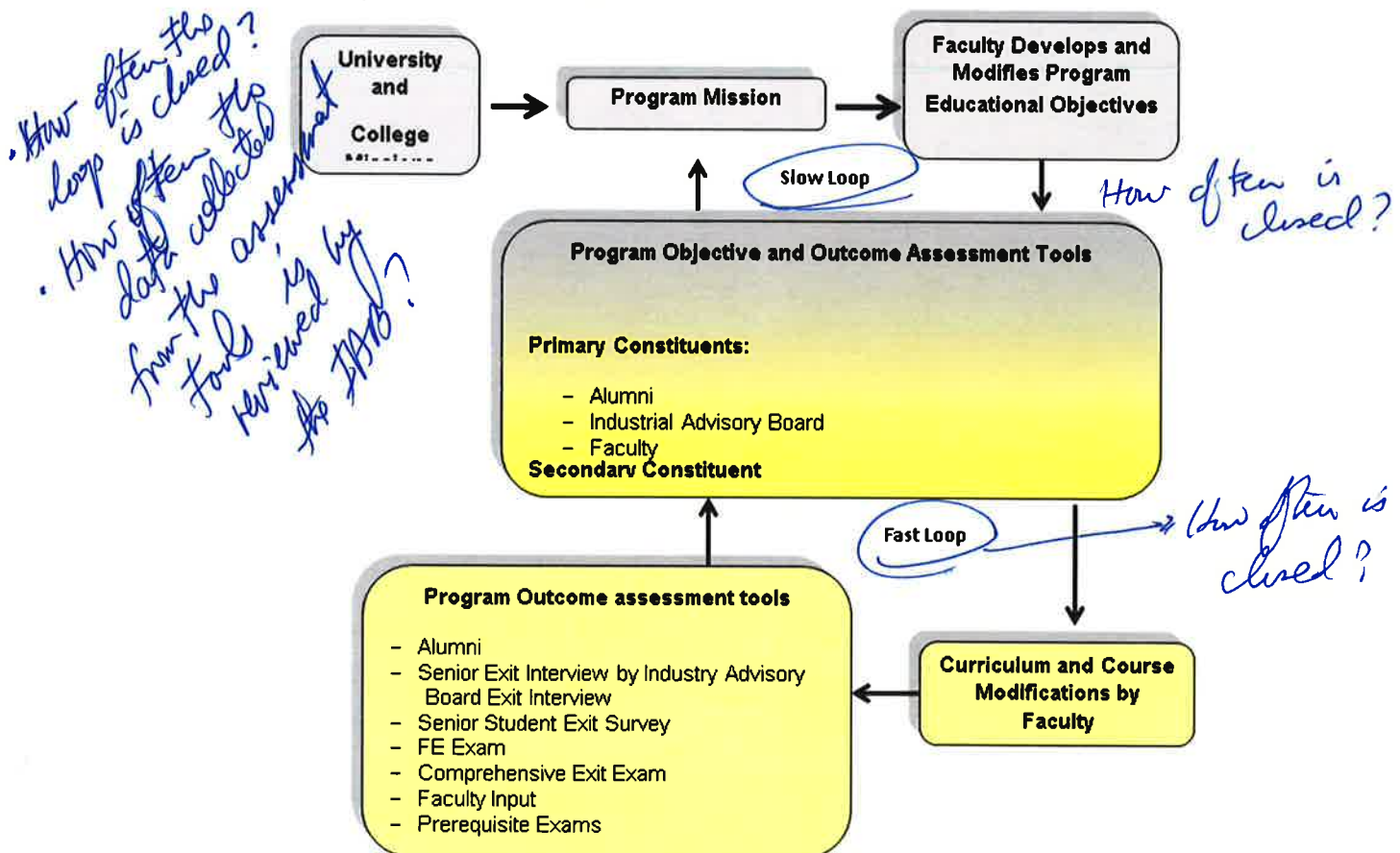


Figure A.2 Assessment of Program Educational Objectives

Appendix B

Detailed Assessment Plan for MS in Mechanical Engineering

I. Mission

The mission of the Master of Science in Mechanical Engineering (MSME) program is to provide the graduate students with an in-depth knowledge through advanced mechanical engineering courses, to introduce graduate students to the process of research through course work, to train students in comprehensive research through project work or thesis, and to prepare MS graduates for continued graduate study towards PhD in engineering.

The mission is in support of the College of Engineering as well as that of the University in teaching, scholarship and service. The constituents of the Mechanical Engineering Graduate program are its graduate students and faculty.

II. Program Objectives

The *Program Educational Objectives (PEO)* of the MS in Mechanical Engineering (MSME) program, as adopted by its constituents and currently followed by the program, are as follows:

1. Prepare graduate students for employment and careers in mechanical engineering profession and advancement in their field,
2. Ensure that graduates have the technical knowledge and academic background necessary to be accepted to other advanced degree program, such as a doctoral of philosophy in mechanical engineering.

III. (Student) Learner Outcomes

To meet the mission and goals of the MS in Mechanical Engineering (MSME), the department has identified the following learner outcomes:

- (a) Graduates will have an ability to self-educate,
- (b) Graduates will have effective communication skills,
- (c) Graduates will have competency in one of the following core areas:
 - Materials Engineering,
 - Thermo-Fluid Sciences,
 - Mechanical Systems and Design.
- (d) Graduates will be able to design and improve systems, components, or processes to meet desired needs
- (e) Graduates will have a knowledge of professional and ethical responsibility.

IV. Assessment of (Student) Learner Outcomes

The assessment of learner outcomes will be performed as follows.

- (a) Graduates will have an ability to self-educate:
 - Graduates will be assessed through research projects in courses offered.
- (b) Graduates will have effective communication skills:

- The writing skills will be assessed through assignments and projects in the required technical writing class CESP750D, and graduate level courses that have writing and presentation components.
- (c) Graduates will have competency in one of the following core areas:
- Materials Engineering,
 - Thermo-Fluid Sciences,
 - Mechanical Systems and Design.
- Graduates will be assessed while taking the core classes in materials engineering, thermo-fluid sciences, and mechanical systems and design.
- (d) Graduates will be able to design and improve systems, components, or processes to meet desired needs:
- Graduates will be assessed while taking classes which emphasize design and improvement of engineering systems. Since, students may be taking different courses to satisfy the graduation requirements, the ME Department will be collecting data from multiple courses offered each semester.
- (e) Graduates will have a knowledge of professional and ethical responsibility:
- Graduate students will be assessed using CITI integrity modules.

Details on the assessment of learner outcomes for MSME program are provided in Table B.1.

Table B.1 Assessment of Learner Outcomes for the MSME Program

Learner Outcome	Assessment Tool	Target/Criterion	Result*
(a) MSME graduates will have an ability to self-educate	➤ Research projects in courses	80%	N/A
(b) MSME graduates will have effective communication skills.	<ul style="list-style-type: none"> ➤ Writing skills - via assignments and projects in the required technical writing class CESP750D; and graduate level courses that have writing component ➤ Presentation skills - via graduate level courses that have presentation component 	80%	N/A
(c) MSME graduates will have competency in core areas of materials engineering, thermo-fluid sciences, and mechanical systems and design.	<ul style="list-style-type: none"> ➤ Graduates will be assessed for several course learner outcomes while taking the core classes in materials engineering, thermo-fluid sciences, and mechanical systems and design. ➤ Graduates will be assessed via prerequisite quizzes in the classes which utilize the concepts developed in the core classes. 	80%	N/A
(d) MSME graduates will be able to design and improve systems, components, or processes to meet desired needs.	➤ Graduates will be assessed for course learner outcomes while taking classes which emphasize design and improvement of engineering systems.	80%	N/A

(e) MSME graduates will have a knowledge of professional and ethical responsibility.	➤ Graduate students will be assessed using CITI integrity modules with average scores reported.	80%	N/A
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*Explanation for missing data: This is the first year that ME Department will be assessing the graduate program using the new criteria.

V. Feedback Loop

- The department has a Graduate Committee composed of the Graduate Coordinator and two faculty members in the department. This committee meets each semester to review the results of the assessment and to provide feedback into the program. The same committee also reviews the program mission, objectives, outcomes, and the assessment process periodically and in consultation with other faculty members.
- Results of the exit survey by the graduate school will be used to identify additional needs and suggestions.
- The graduate school exit survey will be used to adjust departmental corrective actions to faculty availability and attitude.

Appendix C

Detailed Assessment Plan for PhD in Mechanical Engineering

I. Mission

The mission of the Doctor of Philosophy (PhDME) program is to educate and train graduate students in a subspecialty major of mechanical engineering, broaden the knowledge base of the doctoral students in a minor field related to their major specialty, train the doctoral students in effective conduct of research recognized by a team of peers, train the students in presentation skills through research paper presentation and publication, and prepare the doctoral graduates to serve the global community in research and/or education.

The mission is in support of the College of Engineering as well as that of the University in teaching, scholarship and service. The constituents of the Mechanical Engineering Graduate program are its graduate students and faculty.

II. Program Objectives

The *Program Educational Objectives (PEO)* of the PhDME program, as adopted by its constituents are:

1. Prepare graduate students for advanced careers in mechanical engineering profession and advancement in their field.
2. Ensure that graduates have the technical knowledge, professional and research skills for employment in research and/or academic positions.

III. (Student) Learner Outcomes

To meet the mission and goals of the MS in Mechanical Engineering (MSME), the department has identified the following learner outcomes:

- (a) Graduates will have an ability to self-educate and conduct independent scholarly research,
- (b) Graduates will have effective written and oral communication skills,
- (c) Graduates will have competency in one of the core areas of materials engineering, thermo-fluid sciences, mechanical systems and design, as well as their major and minor areas.
- (d) Graduates will be able to design and improve systems, components, or processes to meet desired needs
- (e) Graduates will have a knowledge of professional and ethical responsibility.

IV. Assessment of (Student) Learner Outcomes

The assessment of learner outcomes will be performed as follows.

- (a) Graduates will have an ability to self-educate and conduct independent scholarly research:
 - Graduates will be assessed on their dissertation and publications.
- (b) Graduates will have effective written and oral communication skills:
 - The writing skills will be assessed through assignments and projects in the required technical writing class CESP750D, and graduate level courses that have writing and presentation components. In

addition, students will be evaluated at the time of the dissertation defense for their writing and presentation skills

- (c) Graduates will have competency in one of the core areas of materials engineering, thermo-fluid sciences, mechanical systems and design, as well as their major and minor areas:
 - Graduates will be assessed via taking PhD qualifying, major and minor exams.
- (d) Graduates will be able to design and improve systems, components, or processes to meet desired needs:
 - Graduates will be assessed while taking classes which emphasize design and improvement of engineering systems. Since, students may be taking different courses to satisfy the graduation requirements, the ME Department will be collecting data from multiple courses offered each semester.
- (e) Graduates will have a knowledge of professional and ethical responsibility:
 - Graduate students will be assessed using CITI integrity modules.

Details on the assessment of learner outcomes for MSME program are provided in Table C.1.

Table C.1. Assessment of learner outcomes for the PhDME Program

Learner Outcome	Assessment Tool	Target/Criterion	Result
(a) PhDME graduates will have an ability to self-educate and to conduct independent scholarly research.	<ul style="list-style-type: none"> ➤ Rubric score on dissertation ➤ Research projects in courses 	80%	N/A
(b) PhDME graduates will have effective oral and written communication skills.	<ul style="list-style-type: none"> ➤ Writing skills via assignments and projects in the required technical writing class CESP750D; graduate level courses that have writing component; and dissertation ➤ Presentation skills via graduate level courses that have presentation component; and dissertation defense 	80%	N/A
(c) PhDME graduates will have competency in one of the core, as well as their major and minor areas.	<ul style="list-style-type: none"> ➤ Average scores from qualifying exam. Will require dissertation chair to report a numerical score; ➤ Graduates will be assessed via prerequisite quizzes in the classes which utilize the 	85%	N/A

	concepts developed in the core classes.		
(d) PhDME graduates will be able to design and improve systems, components, or processes to meet desired needs.	➤ Graduates will be assessed for course learner outcomes while taking classes which emphasize design and improvement of engineering systems.	80%	N/A
(e) PhDME graduates will have a knowledge of professional and ethical responsibility.	➤ Graduate students will be assessed using CITI integrity modules with average scores reported	80%	N/A

V. Feedback Loop

- The department has a Graduate Committee composed of the Graduate Coordinator and two faculty members in the department. This committee meets each semester to review the results of the assessment and to provide feedback into the program. The same committee also reviews the program mission, objectives, outcomes, and the assessment process periodically and in consultation with other faculty members.
- Results of the exit survey by the graduate school will be used to identify additional needs and suggestions.
- The graduate school exit survey will be used to adjust departmental corrective actions to faculty availability and attitude.

College: Engineering

Department/Program (s): Mechanical Engineering

Degree (s) Offered: MS, MS, PhD in Mechanical Engineering

Triggers: None

Brief Description of each degree:

The Bachelor of Science in Mechanical Engineering (BSME) program equips graduates with engineering methods, skills, and experience required to design, to develop, and to produce mechanical components or systems in any industry. The program prepares students for job responsibilities through a broad course of study that covers the basic math and sciences, general education courses, mechanical engineering major required courses, as well as the ethical, professional, and communication skills needed to be successful as a practicing mechanical engineer.

The Master of Science in Mechanical Engineering (MSME) degree program prepares students for engineering practice and research in the areas of materials engineering, thermo-fluid sciences, and mechanical systems analysis and design. Students can complete the degree requirement through any of the following options: thesis, directed project, or all coursework."

The Doctor of Philosophy in Mechanical Engineering (PhDME) degree program is directed towards educating students to perform research and advance the knowledge in one of the areas of materials engineering, thermo-fluid sciences, and mechanical systems and design. Students complete the degree requirements through an extensive array of advanced mechanical engineering courses in their major and minor fields, qualifying/preliminary exams, research proposal design, and successful completion and defense of the doctoral dissertation research."

Assessment of the Quality of the Faculty:

In 2011, the faculty in the ME Department published 35 refereed journal articles, together with making numerous presentations at academic conferences and accomplishing other scholarly related activities. The faculty has shrunk from 11 to 7 tenured members. Failed searches in the recent past, coupled with deaths and departures have created this situation. The faculty in the Department appears in disarray. This is reflected in the observation that only two individuals signed the program review document, one of whom was not a tenured member of the ME department, as well as in the comments made by the Dean.

Assessment of the Quality of the Undergraduate Students:

Undergraduate students have a similar average ACT score to the University average. Graduate student admission GPAs seem to be in line with College and University outcomes.

Assessment of Learning Outcomes:

The learning outcomes for the BSME degree are in concert with ABET expectations. The BSME program is accredited by ABET through 2013. In the Dean's comments, it was noted that assessment activities for the BSME are conducted outside the classroom and only at the conclusion of the student's program. The MSME and PhD in ME programs have student learning outcomes that are conducted, for the most part, at the course level. These outcomes have only recently been established, so no data has been collected as of the point in time of this evaluation. Scores on student satisfaction surveys are collected. It is not clear how these results are utilized in a program of continuous improvement.

Placement of Graduates:

Some general information is provided about the placement of BSME graduates from WSU programs. The information provided is lacking in specificity. Most of what is reported relates to aggregate trends from across the country. The same paragraph relating to employment of graduates appears in the BSME, MSME and PhD in ME sections of the report,.

Outside Funding and Support:

According to the document, faculty in the Department have generated grant support of \$2.7, \$1.4 and \$2.6 million dollars over the past three years respectively.

Summary and Recommendations:

- This is **not** a well written or documented review. Much of it is repetitive. Discussions of the assessment activities undertaken are very general, and in the assessment diagram provided, there is no clear indication of how the feedback loop is "closed." There are also some questions that might be posed regarding the department's assessment activities in general.
- Previously, it appears that much of the assessment of the program(s) have involved assessment activities which took place at the conclusion of the student's program. It is indicated in the Dean's comments that the Department is planning to change this approach, and to accomplish more assessment activities in the classroom. This is part of the change which is necessary to allow the Department to move to a climate of continuous improvement, where assessment activities provide the foundation for course and programmatic planning. In this way, the Department can focus its activities on enhancing student retention and student learning.

By April 1, 2013 (send to the Office of the Provost):

- Document that the program review process is a part of a continuous improvement approach involving all departmental faculty.
- Document program changes that occurred through assessment of student learner outcomes and other data collected.
- The learning outcomes for all programs (and general education courses) should be further developed and a revised assessment process needs to be implemented to include the following for all programs:
 - Learning Outcomes: Statements that describe what students are expected to know and be able to do by the time of graduation. These relate to the skills, knowledge, and behaviors that students acquire through their program (e.g., graduates will have the ability to apply principles of engineering physics).
 - Assessment Methods: Direct measures used to identify, collect, and prepare data to evaluate the achievement of learning outcomes (e.g., quantitative literacy evaluated by a rubric, not grades or other indirect measures).
 - Targets: Expectations of students to achieve the desired outcome to demonstrate program effectiveness (e.g., 90% of students will demonstrate at least the benchmark performance on a project).
 - Results: Actual achievement on each measurement (e.g., 94% of the students achieved at least the benchmark performance on the project).
 - Analysis: An evaluation that determines the extent to which learning outcomes are being achieved and leads to decisions and actions to improve the program. The analysis and evaluation should align with specific learning outcomes and consider whether the measurement and target remain valid indicators of the learner.
- Address concerns of the Graduate School in terms of the assessment process for the graduate programs.

Prior to the next review in 2015:

- Include the new university exit and alumni surveys in assessment plan. This will include placement data, salaries, and student satisfaction.