WICHITA STATE UNIVERSITY

Program Review Self-Study

Academic unit: **Mechanical Engineering** College: Engineering

Date of last review: Fall 2015

Date of last accreditation report (if relevant): Fall 2013

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

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Submitted by: Muhammad Mustafizur Rahman (Department Chair) Date _____
(name and title)

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:

The mission of Wichita State University is to be an essential educational, cultural, and economic driver for Kansas and the greater public good.

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 mission of the university and the College of Engineering. The role of the programs is to prepare 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?

No need to change at this time.

e. Provide an overall description of your program (s) including a list of the measurable goals and objectives of the program (s) (programmatic). Have they changed since last review? ☐ Yes ☒ No

The **Bachelor of Science in Mechanical Engineering (BSME)** program equips graduates with engineering methods, skills, and experience required to design, develop, and 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 mathematics and sciences, general education courses, mechanical engineering major required and technical elective 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 Spring 2015 are as follows:

1. Educate students to be a successful mechanical engineer with emphasis on sustainability and globalization.
2. Prepare students to pursue life-long learning.
3. Prepare students for real-world problems through the program's emphasis on experiential learning and industry-based projects in a diverse and innovative work environment.

The *Program Educational Objectives (PEO)* of the BS in Mechanical Engineering (BSME) program were reviewed and slightly modified by its constituents in December 2017 and currently followed by the program, are as follows:

1. Educate students to be successful mechanical engineers with emphasis on sustainability, affordability, and globalization.
2. Prepare students to pursue life-long learning.
3. Prepare students for real-world problems through applied learning and industry-based projects for diverse and dynamic environment.

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 requirements 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,
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. In addition, each graduate is evaluated by the thesis committee at the time of his/her defense of thesis or project in terms of overall contribution, oral presentation, and quality of writing. 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. In addition, each graduate is evaluated by the dissertation committee at the time of his/her defense of dissertation in terms of overall contribution, oral presentation, and the quality of writing. The details of the PhDME program assessment is provided in Appendix C.

2. 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/creative activity (refer to instructions in the WSU Program Review document for more information on completing this section).

Complete the table below and utilize data tables 1-7 provided by the Office of Planning Analysis (covering SCH by FY and fall census day, instructional faculty; instructional FTE employed; program majors; and degree production).

Scholarly Productivity	Number Journal Articles		Number Presentations		Number Conference Proceedings		Performances			Number of Exhibits		Creative Work		No. Books	No. Book Chaps.	No. Grants Awarded or Submitted	$ Grant Value
	Ref	Non-Ref	Ref	Non-Ref	Ref	Non-Ref	*	**	***	Juried	****	Juried	Non-Juried				
Year 1 (2015)	46		60		47									2	16	65	$671,251
Year 2 (2016)	29		60		43									2	6	71	$255,350
Year 3 (2017)	38		66		45									0	8	60	$1,375,500

* Winning by competitive audition. **Professional attainment (e.g., commercial recording). ***Principal role in a performance. ****Commissioned or included in a collection.

Table 1: Fiscal Year Summation of Student Credit Hour (SCH) Production

	Fiscal Year (summer-fall-spring sequence)							Rolling 5 year average		
Course level:	2011	2012	2013	2014	2015	2016	2017	2011-2015	2012-2016	2013-2017
Total	6296	6084	5539	6759	8310	9259	9660	6598	7190	7905
100-299	716	779	798	1001	1027	1032	1169	864	927	1005
300-499	1488	1654	1544	2026	2974	3190	3323	1937	2278	2611
500-699	2937	2261	2015	2429	2487	3183	2838	2426	2475	2590
700-799	664	857	685	951	1206	1262	1775	873	992	1176
800-899	396	420	311	241	466	393	408	367	366	364
900-999	95	113	186	111	150	199	147	131	152	159

Note: SCH of all enrolled department offerings summated by FY for each census day; in some cases department level SCH includes entire department offerings.

Table 2: Student Credit Hour (SCH) Production at Fall Census Day

	Year of Fall Census Day							Rolling 5 year average		
Course level:	2010	2011	2012	2013	2014	2015	2016	2010-2014	2011-2015	2012-2016
Total	2988	2905	2633	3117	3772	4365	4551	3083	3358	3688
100-299	402	410	426	492	451	607	621	436	477	519
300-499	492	618	594	701	1088	1353	1374	699	871	1022
500-699	1647	1226	1060	1313	1365	1653	1563	1322	1323	1391
700-799	242	399	369	505	691	543	721	441	501	566
800-899	163	211	105	66	109	131	217	131	124	126
900-999	42	41	79	40	68	78	55	54	61	64

Note: SCH of all enrolled department offerings at fall census day.

Table 3: Student Credit Hour (SCH) Production among Department Instructional Faculty on November Employee Census Day (entire term SCH)

	Year of November Census Day							Rolling 5 year average		
Employee type:	2010	2011	2012	2013	2014	2015	2016	2010-2014	2011-2015	2012-2016
Program Total	2847	2686	2443	2921	398	4185	4541	2919	3187	3558
Tenure eligible faculty	2362	2136	1669	2585	3338	3672	4179	2418	2680	3089
Non-tenure eligible faculty	5	0	450	0	0	246	318	91	139	203
Lecturers	270	396	186	207	270	0	0	266	212	133
GTA	210	152	138	129	90	267	44	144	155	134
Unclassified professional	0	0	0	0	0	0	0	0	0	0
Classified Staff	0	0	0	0	0	0	0	0	0	0
GSA, GRA, UG std	0	0	0	0	0	0	0	0	0	0

Note: faculty/staff with active class assignments and employment at November freeze; employee type based on ecls and egrp matrix.

Table 4: Instructional FTE Employed on November 1st Census Day

	Year of November Census Day							Rolling 5 year average		
Employee type:	2010	2011	2012	2013	2014	2015	2016	2010-2014	2011-2015	2012-2016
Program Total	8.2	11.4	11.5	11.1	11.1	15.4	20.0	10.7	12.1	13.8
Tenure eligible faculty	5.8	7.2	6.8	9.8	9.8	13.9	14.0	7.9	9.5	10.9
Non-tenure eligible faculty	0.2	0.0	0.3	0.0	0.0	1.0	2.0	0.1	0.3	0.7
Lecturers	0.7	1.2	0.5	0.7	0.7	0.0	0.0	0.8	0.6	0.4
GTA	1.5	2.9	4.0	0.5	0.5	0.5	4.0	1.9	1.7	1.9
Unclassified professional	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Classified Staff	0.0	0.0	0.0	0.0	0.0	0.0	1.0	0.00	0.0	0.2
GSA, GRA, UG student	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Note: active employment positions at November 1st freeze; employee type based on ecls and egrp matrix, fte of 1 based on 80 hour bi-week appointment; employee type based on ecls and egrp matrix; KBOR minima for faculty (TTF) 3 for UG, plus 3 for masters, plus 2 for doctoral.

Table 5a: Student Credit Hour (SCH) by FTE for University Instructional Faculty on November 1st Census Day

	Year of November Census Day							Rolling 5 year average		
Employee type:	2010	2011	2012	2013	2014	2015	2016	2010-2014	2011-2015	2012-2016
(University level) Total	236	231	222	225	222	213	216	227	223	220
Tenure eligible faculty	227	216	194	194	195	183	194	205	196	192
Non-tenure eligible faculty	300	284	289	306	304	296	295	297	296	298
Lecturers	274	270	295	302	292	264	254	286	284	281
GTA	212	208	201	206	183	192	184	202	198	193
Unclassified professional	116	157	122	106	101	94	114	120	116	107
Classified Staff	42	53	121	77	114	61	0	81	85	75
GSA, GRA, UG student	0	0	0	0	0	0	0	0	0	0

Note: active employment positions at November 1st freeze; employee type based on ecls and egrp matrix; instructional defined as active course enrollment.

Table 5b: Student Credit Hour (SCH) by FTE for College Division Instructional Faculty on November 1st Census Day

	Year of November Census Day							Rolling 5 year average		
Employee type:	2010	2011	2012	2013	2014	2015	2016	2010-2014	2011-2015	2012-2016
(College Division level) Total	320	279	276	297	331	332	346	301	303	316
Tenure eligible faculty	245	203	194	207	221	221	248	214	209	218
Non-tenure eligible faculty	592	464	474	495	595	590	627	524	524	556
Lecturers	449	360	429	477	451	497	407	433	443	452
GTA	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Unclassified professional	192	266	258	224	225	229	208	233	240	229
Classified Staff	2	1	88	50	105	110	n/a	49	71	71
GSA, GRA, UG student	0	0	0	0	0	0	0	0	0	0

Note: active employment positions at November 1st freeze; employee type based on ecls and egrp matrix; instructional defined as active course enrollment.

Table 5c: Student Credit Hour (SCH) by FTE for Program Instructional Faculty on November 1st Census Day

	Year of November Census Day							Rolling 5 year average		
Employee type:	2010	2011	2012	2013	2014	2015	2016	2010-2014	2011-2015	2012-2016
(Program level) Total	347	236	212	264	334	272	227	278	263	262
Tenure eligible faculty	408	295	245	263	340	264	299	310	281	282
Non-tenure eligible faculty	32	n/a	1800	n/a	n/a	246	159	366	409	441
Lecturers	360	317	372	276	360	n/a	n/a	337	265	202
GTA	140	52	35	258	180	534	11	133	212	204
Unclassified professional	0	0	0	0	0	n/a	0	0	0	0
Classified Staff	0	0	0	0	0	0	0	0	0	0
GSA, GRA, UG student	0	0	0	0	0	0	0	0	0	0

Note: active employment positions at November 1st freeze; employee type based on ecls and egrp matrix; instructional defined as active course enrollment.

Table 6: Program Majors (including double majors) on Fall Census Day

	Year of Fall Census Day							Rolling 5 year average		
Student Class	2010	2011	2012	2013	2014	2015	2016	2010-2014	2011-2015	2012-2016
Total	526	491	539	609	671	694	659	567	601	634
Freshmen	68	69	103	86	90	83	80	83	86	88
Sophomore	72	59	92	102	107	109	76	86	94	97
Junior	81	72	81	116	120	144	140	94	107	120
Senior	193	196	182	212	250	249	271	207	218	233
Masters	92	76	63	75	83	87	73	78	77	76
Post masters	0	0	0	0	0	0	0	0	0	0
Doctoral	20	19	18	18	21	22	19	19	20	20
Other	0	0	0	0	0	0	0	0	0	0

Note: includes all active program matching majors among 4 possible major codes; other includes guest & nondegree students; KBOR minima 25UG, 20 GR mast & 5 GR doc.

Table 7: Degree Production by Fiscal Year

	Fiscal Year (summer-fall-spring sequence)							Rolling 5 FY average		
Student Class	2011	2012	2013	2014	2015	2016	2017	2011-2015	2012-2016	2013-2017
Total	106	101	86	108	108	115	127	102	104	109
Doctoral	3	4	2	5	2	6	2	3	4	3
Masters	32	31	20	31	27	25	26	28	27	26
Bachelor	71	66	64	72	79	84	99	70	73	80
Associate	0	0	0	0	0	0	0	0	0	0

Note: includes all active program matching majors among 4 possible major codes; KBOR minima 10 UG , 5 GR masters & 2 GR doctoral.

- Provide a brief assessment of the quality of the faculty/staff using the data from the table above and tables 1-7 from the Office of Planning Analysis 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.

  Provide assessment here:

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

With regards to scholarly activity and research, the department has seen very good productivity in the number of referred journal publications, reviewed conference proceedings, and funded research. The ME faculty published 46, 29, and 38 refereed journal papers in 2015, 2016, and 2017 respectively. The ME faculty also published 47, 43 and 45 reviewed articles in conference proceedings in 2015, 2016, and 2017 respectively. They were also quite active in producing other technical papers, contract reports, and presentations without proceedings. During this 3 years period, the faculty also contributed to the writing of 4 books and 30 book chapters. While some faculty members have published more than others, other faculty members have focused more on research grants. The ME faculty submitted 65, 71, and 60 research proposals, yielding in $671,251, $255,350, and $1,375,500 research funding in 2015, 2016, and 2017, respectively. The faculty provided funds for student support, and engaged both undergraduate and graduate students in their research activities. Overall, the ME faculty have continued to publish a good number of refereed journal papers and reviewed conference papers, and prepared and submitted a large number of research proposals for possible funding (internal or external). The amount of money generated through funded research during 2015-2017 is $2,302,101. These funds have helped the ME Department tremendously in carrying out research expenses (equipment, materials, and supplies) as well as support students to rigorously contribute to research activities. The ME faculty have also won university and national awards for their significant contributions to research and scholarly activities. These include the Wallace Excellence in Research award, John A. See Research award, the University Young Faculty Scholar award, and the University Excellence in Research award.

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. From Table 4, it can be seen that tenured or tenure-track faculty dropped to 6.8 in 2012 and moved to 9.8 in 2013 with the hire of new Assistant Professors in the department. The number of tenured or tenure-track faculty increased to 13.9 in 2015 and to 14 in 2016. The rolling 5 year average increased steadily in the period 2010-2016 with the new hiring in vacated lines as well as in new lines allocated to the ME Department. The department was able to effectively using non tenure eligible teaching faculty, adjunct lecturer, and GTA to augment teaching activities as needed to handle the demands of increased enrollment. As seen in Tables 1 and 2, the 5-year rolling average of the number of student credit hours (SCH) increased steadily during 2015-2017. The increase is across the board including 700-799 level courses due to more offerings of technical electives and graduate courses. From Table 5, it can be observed that the department was able to produce significantly higher SCH compared to college and the university, showing high level of average teaching productivity by the tenured or tenure-track faculty in the department. From Table 6, it can be observed that the 5-year rolling average of total enrollment increased very significantly (from 567 to 634) during last three reporting periods. The surge is across the broad in freshmen through senior levels in the undergraduate program. Enrollment at the graduate level remained about the same during the last three years. From Table 7, it can be observed that the degree production at the Masters and Doctoral level remained about the same, whereas it increased significantly at the Bachelor level. In fact, the Bachelor degree completion has increased by a large number in every year (79 in 2015, 84 in 2016, and 99 in 2017) giving an overall increase of 37.5% in the period 2014-2017. During the last three years, 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, and the University Exceptional Education Award and Online Teaching Fellowship.

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. Three faculty members in the ME Department have been granted with "fellow" by the ASME, out of 4 fellows of professional societies in the entire College of Engineering. Two faculty members also serve as Program Evaluators in the Engineering Accreditation Commission of ABET. The ME faculty are also active and act as advisor for Students Sections of professional societies, such as the ASME, Pi Tau Sigma, SAE Mini Baja, SAE Formula Car, and ASHRAE. The service award received by ME faculty during the last 3 years include two Outstanding Reviewer Awards by professional journals.

3. **Academic Program: Analyze the quality of the program as assessed by its curriculum and impact on students 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. (Evaluate table 8 [ACT data] from the Office of Planning and Analysis).

Table 8: Mean ACT score of juniors and Seniors Enrolled on Fall Census Day (source=Fall Census Day

	Year of Fall Census Day							Rolling 5 year average		
Statistics	2010	2011	2012	2013	2014	2015	2016	2010-2014	2011-2015	2012-2016
University Level	22.7	22.8	23.0	23.0	23.1	23.0	23.1	22.9	23.0	23.1
Program majors	23.3	23.3	23.6	24.3	24.5	24.8	24.6	23.9	24.2	24.4
Program majors count	274	268	263	328	370	393	411	301	324	353
Reporting ACT	142	134	125	162	183	197	227	149	160	179
Percent Reporting	51.8%	50.0%	47.5%	49.4%	49.5%	50.1%	55.2%	49.6%	49.4%	50.7%

Note: If ACT missing and SAT available, SAT is used converted to ACT metric; KBOR captures ACT data for enrolled juniors & seniors only; KBOR minima>=20.

From the 5-year rolling average data presented in Table 8, the mean ACT score of juniors and seniors increased slightly and steadily during the last three years. The Mechanical Engineering students have consistently maintained higher ACT score compared to the university average during the entire reporting period. The

average for ME students also increased at a higher rate (23.9 to 24.4) compared to all students at WSU (22.9 to 23.1) during the last three years.

b. For graduate programs, compare graduate GPAs of the majors with University graduate GPAs. (Evaluate table 9 [GPA data] from the Office of Planning and Analysis)

Table 9: Mean Application GPA of Admitted Graduate Student Majors (source=Applications)

	Fiscal Year (summer-fall-spring sequence)							Rolling 5 FY average		
Statistics	2011	2012	2013	2014	2015	2016	2017	2011-2015	2012-2016	2013-2017
University Level	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5
Program majors	3.5	3.5	3.4	3.4	3.5	3.4	3.2	3.4	3.4	3.4
Program majors count	77	55	80	107	157	133	144	95.2	106.4	124.2
Reporting ACT	37	29	25	20	21	17	18	26.4	22.4	20.2
Percent Reporting	48.1%	52.7%	31.3%	18.7%	13.4%	12.8%	12.5%	27.7%	21.1%	16.3%

Note: Graduate student application GPA based on last 60 hours of course work earned.

The average GPA reported in Table 9 for the university is uniformly at 3.5. The department was able to maintain nearly the same GPA (3.4) during 2015-2017.

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 in the table below. 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 learning 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 Outcomes	Assessment Tool	Target/Criterion	Average 2015-17 Results
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	50% 3.5/5.0	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%	93.5%
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	93.5% 100%
BSME graduates will attain: (d) An ability to function on a multidisciplinary team.	➢ Capstone Design: Team Member Peer Evaluations	85%	95.2%
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	97.2% 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	97.2% 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%	3.9/5.0 100%
BSME graduates will attain: (i) A recognition of the need for, and an ability to engage in, life-long learning.	➢ ME Senior Chair Survey	3.0/5.0	4.6/5.0
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% 3.9/5.0

It may be noted that assessment results during last three years (2015 -2017) came out higher compared to the set target at each (a-k) assessment categories. The ME department will continue to evaluate and assess these outcomes.

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

Learning Outcomes	Assessment Tools	Target/Criterion	Average 2015-17 Results
(a) MSME graduates will have an ability to self-educate	➢ Research projects in courses	80%	85%
(b) MSME graduates will have effective communication skills.	➢ Writing skills - via assignments and projects in the graduate level courses that have writing component ➢ Presentation skills - via graduate level courses that have presentation component	80%	83%
(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%	100%
(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%	90%
(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%	100%

The learning outcomes (a) through (d) were evaluated in a number of graduate level courses offered by the ME department. In addition, these learning outcomes were evaluated by each committee member using MSME Theses/Project Assessment Form. The average of the collected results are presented. The learning outcome (e) on professional and ethical responsibility was evaluated using CITI modules. The students were required to take 4 CITI modules to satisfy the professional and ethical responsibility before they could graduate. This was implemented starting from Fall 2012. All

graduate students took and passed the four modules: Research misconduct, Data Management, Authorship, and Conflict of Interest.

It may be noted that MSME learning outcomes were satisfied quite well during 2015-2017. The average performance score exceeded the target score in all categories of the learning outcome assessment. The ME department plans to continue the same evaluation process in the future.

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

Learning Outcomes	Assessment Tools	Target/Criterion	Average 2015-2017 Results
(a) PhDME graduates will have an ability to self-educate and to conduct independent scholarly research.	➢ Rubric score on dissertation ➢ Research projects in courses	80%	90%
(b) PhDME graduates will have effective oral and written communication skills.	➢ Writing skills via assignments and projects in the graduate level courses that have writing component; and dissertation ➢ Presentation skills via graduate level courses that have presentation component; and dissertation defense	80%	90%
(c) PhDME graduates will have competency in one of the core, as well as their major and minor areas.	➢ 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%	100%
(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%	100%
(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%	100%

The assessment was done using data collected from graduate level courses as well as the assessment of PhD Dissertation by each committee member using PhD Dissertation Assessment Form. The average of the collected results are presented. The professional and ethical responsibility were evaluated using CITI modules. The students were required to take 4 CITI modules to satisfy the professional and ethical responsibility before they could graduate. This was implemented starting from Fall 2012. All graduate students took and passed the four modules: Research misconduct, Data Management, Authorship, and Conflict of Interest.

It may be noted that PhDME learning outcomes were satisfied quite well during 2015-2017. The average performance score well exceeded the target score in all categories of the learning outcome assessment. The ME department plans to continue the same evaluation process in the future.

d. Provide aggregate data on student majors satisfaction (e.g., exit surveys), capstone results, licensing or certification examination results (if applicable), 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 outcomes of the program as listed in 3c).

Evaluate table 10 from the Office of Planning and Analysis regarding student satisfaction data.

Table 10: Satisfaction with Program among Undergraduate and Graduate Students at End of Program Exit

	Academic Year (Fall-Spring-Summer Sequence)							Rolling 5 AY average		
Student Level:	2011	2012	2013	2014	2015	2016	2017	2011-2015	2012-2016	2013-2017
University **Undergraduate** level	n/a	79.5%	82.9%	81.4%	80.9%	80.7%	82.3%	n/a	81.1%	81.6%
College Division Undergraduate level	n/a	63.4%	70.1%	75.0%	73.5%	68.1%	70.4%	n/a	70.0%	71.4%
Program Undergraduate majors:										
Percent satisfied or very satisfied	n/a	69.6%	64.7%	68.4%	70.7%	61.0%	58.0%	n/a	66.9%	64.6%
Mean	n/a	3.8	3.7	3.8	3.9	3.7	3.7	n/a	3.8	3.8
Median	n/a	4	4	4	4	4	4	n/a	4	4
Count	n/a	56	68	79	82	100	100	n/a	77	85.8
University **Graduate** Level	n/a	80.0%	82.6%	82.1%	84.9%	85.4%	82.9%	n/a	83.0%	83.6%
College Division Graduates level	n/a	84.5%	84.3%	82.2%	91.3%	87.0%	84.6%	n/a	85.9%	85.9%
Program Graduate majors:										
Percent satisfied or very satisfied	n/a	76.7%	71.0%	74.1%	89.2%	87.5%	78.4%	n/a	79.7%	80.0%
Mean	n/a	4.2	3.9	4.0	4.3	4.4	4.2	n/a	4.1	4.2
Median	n/a	4	4	4	4	5	4	n/a	4.2	4.2
Count	n/a	43	31	27	37	40	37	n/a	35.6	34.4

Note: Primary majors only; data from the Application For Degree Exit Survey; scale of 1 to 5 with 5 being high (very satisfied).

From the exit survey data presented in Table 10, it can be noticed that the ME department score came out a bit lower than the average score for the College of Engineering as well as the Wichita State University. This gives a signal that some improvements in the delivery of program to students are needed at both undergraduate and graduate levels. The faculty in ME department has already initiated experiments in alternate learning mechanisms in and out of classroom. In addition, curriculum changes are being made to introduce more hands-on learning experience for students. These are likely to improve learning satisfaction from our students.

Learner Outcomes (e.g., capstone, licensing/certification exam pass-rates) by year, for the last three years				
Year	N	Name of Exam	Program Result	National Comparison±
1 (2015)		Capstone	63%	50.4%
2 (2016)		Capstone	61%	51.2%
3 (2017)		Capstone	62%	55.2%

± 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.

It may be noted that WSU Mechanical Engineering graduates performed better in the comprehensive exit examination compared to national average in each year during 2015-2017. This indicates better quality of workforce development in our undergraduate program.

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).

Outcomes:	Results	
	Majors	Non-Majors
o Have acquired knowledge in the arts, humanities, and natural and social sciences o Think critically and independently o Write and speak effectively o Employ analytical reasoning and problem solving techniques		

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/

The BSME program requires each student to complete a minimum of 30 credit hours of general education that contain courses in the arts, humanities, and social sciences. In addition, students are required to complete a minimum of 33 credit hours of mathematics and natural sciences. The learning assessment is done using ABET criteria (h) - The broad education necessary to understand the impact of engineering solutions in a global and social context. The assessment results are presented in the Table – BSME Assessment Criteria in pages 13-14. Only Mechanical Engineering majors were assessed. Please refer to Tables A.2 and A.3 in Appendix A for the mapping of ABET criteria to the courses.

The critical and independent thinking capability was assessed using ABET criteria (c) - An ability to design a system, component, or process to meet desired needs. The assessment results are presented in the Table – BSME Assessment Criteria in pages 13-14.

The effective writing and speaking skills were assessed using ABET criteria (g) - An ability to communicate effectively. The assessment results are again presented in the Table – BSME Assessment Criteria in pages 13-14.

The use of analytical reasoning and problem solving techniques were assessed in a number of courses. Several learning outcomes were assessed using ABET criteria (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, and (e) - An ability to identify, formulate, and solve engineering problems. The assessment results are again presented in the Table – BSME Assessment Criteria in pages 13-14.

f. For programs/departments with concurrent enrollment courses (per KBOR policy), provide the assessment of such courses over the last three years (disaggregated by each year) that assures grading standards (e.g., papers, portfolios, quizzes, labs, etc.) course management, instructional delivery, and content meet or exceed those in regular on-campus sections.
   Provide information here:

Mechanical Engineering Department did not happen to offer any course that fall into this category during 2015-2017 time period.

g. Indicate whether the program is accredited by a specialty accrediting body including the next review date and concerns from the last review.
   Provide information here:

The Bachelor of Science in Mechanical Engineering program is accredited by ABET. At the time of last review in Fall 2013, the following concern was indicated by the accreditation agency.

1. Faculty size.
2. Funds for the maintenance of existing laboratory equipment.

The Mechanical Engineering Department added four tenure-track faculty members in Fall 2013, two tenure-track faculty members in Fall 2016, and three tenure-track faculty members in Fall 2017. The department is in the final stage of negotiations to complete the hiring for 2 tenure-track faculty members in Fall 2018. It is expected that by Fall 2018, this concern will be very adequately addressed.

The department has moved all instructional laboratories corresponding to ME 251, ME 533, and ME 633 courses in the new Experiential Engineering Building. These laboratories have been upgraded with the purchase of new equipment (approximately $50,000 for each laboratory). The department plans to maintain the older equipment on a regular basis to keep these laboratories functional at the excellent level. It is anticipated that this concern will be adequately addressed before the next ABET visit in 2020.

h. Provide the process the department uses to assure assignment of credit hours (per WSU policy 2.18) to all courses has been reviewed over the last three years.
   Provide information here:

All courses offered by the Mechanical Engineering Department have 3 credit hours expect for ME 251 which is a laboratory class with 1 credit hour. All proposed new courses are reviewed and approved by Department Faculty

as well as the College of Engineering Curriculum Committee. These evaluation processes assure that contents match the credit hours per WSU policy 2.18.

i. Provide a brief assessment of the overall quality of the academic program using the data from 3a – 3e 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).
Provide assessment here:

The rolling 5 year average ACT score for the BSME program (24.2) is more than the university average (23.1). The number of students in the BSME has grown significantly since the last review to over 560. The number of BSME granted degree has also increased to 99 students in 2017. In terms of enrollment in graduate programs, both MSME and PhD enrollments remained about the same in the period 2015-2017. ME department has awarded 78 MSME degrees and 10 PhD degrees during this period.

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.

In addition to separate assessment of our Masters and PhD level graduate programs presented in section 3(c), the ME Department also monitored the number of publications authored by graduate students as an additional item to monitor the success of graduate programs. This is presented in the table below.

Publications with Graduate Students	**2015**	**2016**	**2017**
Graduate Student Co-Authored Journal Publications	32	20	27
Graduate Student Co-Authored Conference Publications	42	42	46

The number of journal publications as well as the total number of peer reviewed articles (journals + conference proceedings) published by Mechanical Engineering graduate students were significant and increased during the 2015-2017 time period.

4. 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. Evaluate tables 11-15 from the Office of Planning Analysis for number of applicants, admits, and enrollments and percent URM students by student level and degrees conferred.

Table 11: Applications, Admits and Enrollment for Undergraduate and Graduate Applicants

	Fiscal Year (summer-fall-spring sequence)							Rolling 5 FY average		
Student Level:	2011	2012	2013	2014	2015	2016	2017	2011-2015	2012-2016	2013-2017
Undergraduates:										
Applicants	196	209	274	233	286	323	365	240	265	296
Admitted	189	200	262	227	280	302	334	232	254	281
Census day	102	120	161	127	154	127	134	133	138	141
Graduates:										
Applicants	112	105	118	188	287	260	266	162	191.6	223.8
Admitted	77	58	83	111	166	137	145	99	111	128.4
Census day	41	39	39	50	61	56	34	46	49	48

Note: Unduplicated count as last record of FY; applicants exclude incomplete or cancelled applicants.

Table 12: Percent Under-represented Minorities (URM) on Fall Census Day

	Year of Fall Census Day							Rolling 5 year average		
Student Level	2010	2011	2012	2013	2014	2015	2016	2010-2014	2011-2015	2012-2016
University level:										
Freshmen & Sophomores	16.9%	17.9%	18.5%	18.5%	19.2%	19.1%	19.9%	18.2%	18.7%	19.1%
Juniors & Seniors	14.0%	14.8%	15.4%	14.9%	15.7%	15.9%	16.7%	15.0%	15.3%	15.7%
Masters	8.2%	9.8%	11.3%	9.7%	9.9%	10.2%	10.7%	9.8%	10.2%	10.4%
Doctoral	6.6%	5.4%	6.7%	6.5%	7.0%	9.0%	11.5%	6.4%	6.9%	8.1%
College division level:										

Freshmen & Sophomores	11.3%	10.9%	12.1%	11.8%	13.4%	15.1%	13.6%	11.9%	12.7%	13.2%
Juniors & Seniors	8.9%	10.4%	11.6%	10.4%	10.2%	11.1%	12.6%	10.3%	10.7%	11.2%
Masters	3.3%	4.1%	5.8%	3.0%	3.3%	4.3%	4.7%	3.9%	4.1%	4.2%
Doctoral	2.0%	0.0%	1.0%	1.8%	2.6%	3.4%	4.3%	2.2%	2.2%	2.5%
Program level:										
Freshmen & Sophomores	13.6%	13.3%	13.3%	14.4%	15.7%	17.7%	21.2%	14.1%	14.9%	16.5%
Juniors & Seniors	7.3%	7.5%	8.0%	8.8%	9.2%	10.9%	11.9%	8.2%	8.9%	9.8%
Masters	3.3%	3.9%	6.3%	5.3%	3.6%	4.6%	5.5%	4.5%	4.8%	5.1%
Doctoral	5.0%	0.0%	5.6%	5.6%	9.5%	9.1%	10.5%	5.1%	5.9%	8.1%

Note: Includes all active program matching majors among 4 possible major codes; URM includes black non-Hispanic, Hispanic, American Indian/Alaskan native and Hawaiian.

Table 13: Race/Ethnicity on Fall Census Day

	Year of Fall Census Day							Rolling 5 Year average		
Student Level:	2010	2011	2012	2013	2014	2015	2016	2010-2014	2011-2015	2012-2016
Total	526	491	539	609	671	694	659	567	601	634
Total URM	43	40	52	61	70	83	88	53	61	71
Freshmen & Sophomores Total	140	128	195	188	197	192	156	170	180	186
White non-Hispanic	84	65	93	83	93	93	74	84	85	87
Black non-Hispanic	4	5	7	5	5	4	6	5	5	5
Hispanic	13	12	18	21	25	30	25	18	21	24
Asian non-Hispanic	11	13	10	18	22	20	14	15	17	17
American Indian/Alaskan Native	2	0	1	1	1	0	2	1	1	1
Foreign	14	20	51	49	40	33	28	35	39	40
Hawaiian	0	0	0	0	0	0	0	0	0	0
Multiple race	8	7	7	5	6	7	5	6	6	6
Unknown	5	6	8	6	5	5	2	6	6	5

Juniors & Seniors Total	274	268	263	328	370	393	411	301	324	353
White non-Hispanic	137	134	135	178	198	201	196	156	169	182
Black non-Hispanic	7	6	5	5	6	8	6	6	6	6
Hispanic	10	11	14	22	23	31	39	16	20	26
Asian non-Hispanic	66	61	55	49	43	50	49	55	52	49
American Indian/Alaskan Native	3	2	2	2	5	3	3	3	3	3
Foreign	42	40	37	51	75	81	92	49	57	67
Hawaiian	0	1	0	0	0	1	1	0	0	0
Multiple race	2	4	2	5	5	6	12	4	4	6
Unknown	7	9	13	16	15	12	13	12	13	14
Master Total	92	76	63	75	83	87	73	78	77	76
White non-Hispanic	26	21	15	12	14	12	15	18	15	14
Black non-Hispanic	1	2	1	2	1	0	1	1	1	1
Hispanic	2	1	3	2	2	4	3	2	2	3
Asian non-Hispanic	12	13	8	9	6	8	5	10	9	7
American Indian/Alaskan Native	0	0	0	0	0	0	0	0	0	0
Foreign	49	38	35	49	60	63	48	46	49	51
Hawaiian	0	0	0	0	0	0	0	0	0	0
Multiple race	1	0	0	0	0	0	0	0	0	0
Unknown	1	1	1	1	0	0	1	1	1	1
Doctoral Total	20	19	18	18	21	22	19	19	20	20
White non-Hispanic	4	4	3	3	5	5	5	4	4	4
Black non-Hispanic	0	0	1	1	1	1	1	1	1	1
Hispanic	0	0	0	0	0	0	1	0	0	0
Asian non-Hispanic	2	2	2	3	3	1	0	2	2	2
American Indian/Alaskan Native	1	0	0	0	1	1	0	0	0	0
Foreign	13	13	12	11	11	14	12	12	12	12

Hawaiian	0	0	0	0	0	0	0	0	0	0
Multiple race	0	0	0	0	0	0	0	0	0	0
Unknown	0	0	0	0	0	0	0	0	0	0

Note: Includes all active program matching majors among 4 possible major codes.

Table 14: Percent Under-represented Minorities (URM) of Degreed Conferred Students by Fiscal Year

	Year of Fall Census Day							Rolling 5 year average		
Degree Level:	2011	2012	2013	2014	2015	2016	2017	2011-2015	2012-2016	2013-2017
University level:										
Doctoral	7.6%	6.5%	7.8%	4.7%	6.9%	6.7%	10.0%	6.7%	6.5%	7.2%
Masters	6.4%	9.0%	10.8%	10.0%	8.6%	9.6%	9.6%	9.0%	9.6%	9.7%
Bachelor	12.1%	12.8%	12.7%	13.6%	14.3%	15.1%	14.1%	13.1%	13.7%	13.9%
Associate	18.8%	18.4%	21.2%	26.7%	20.8%	26.4%	16.2%	21.2%	22.7%	22.3%
College division level										
Doctoral	22.2%	0.0%	7.7%	0.0%	0.0%	0.0%	4.5%	4.9%	1.5%	2.4%
Masters	1.6%	3.3%	2.7%	3.0%	1.4%	2.5%	2.4%	2.4%	2.6%	2.4%
Bachelors	5.1%	7.9%	11.5%	10.5%	10.8%	8.8%	7.2%	9.2%	9.9%	9.8%
Associate	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Program level:										
Doctoral	33.3%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	6.7%	0.0%	0.0%
Masters	0.0%	6.5%	5.0%	3.2%	3.7%	4.0%	3.8%	3.7%	4.5%	4.0%
Bachelors	4.2%	6.1%	12.5%	5.6%	8.9%	8.3%	4.0%	7.4%	8.3%	7.9%
Associate	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a

Note: Includes all active program matching majors among 4 possible major codes; URM includes Black non-Hispanic, Hispanic, American Indian/Alaskan Native & Hawaiian.

Table 15: Race/Ethnicity of Degreed Conferred Students by Fiscal Year

	Year of Fall Census Day							Rolling 5 year average		
Degree level:	2011	2012	2013	2014	2015	2016	2017	2011-2015	2012-2016	2013-2017
Total	106	101	86	108	108	115	127	102	104	109
Total URM	4	6	9	5	8	8	5	6	7	7
Doctoral Total	3	4	2	5	2	6	2	3	4	3
White non-Hispanic	0	2	0	1	0	2	1	1	1	1
Black non-Hispanic	1	0	0	0	0	0	0	0	0	0
Hispanic	0	0	0	0	0	0	0	0	0	0
Asian non-Hispanic	0	1	1	0	0	1	0	0	1	0
American Indian/ Alaskan Native	0	0	0	0	0	0	0	0	0	0
Foreign	2	1	1	4	2	3	1	2	2	2
Hawaiian	0	0	0	0	0	0	0	0	0	0
Multiple race	0	0	0	0	0	0	0	0	0	0
Unknown	0	0	0	0	0	0	0	0	0	0
Masters Total	32	31	20	31	27	25	26	28	27	26
White non-Hispanic	9	7	3	8	6	2	5	7	5	5
Black non-Hispanic	0	1	0	1	1	0	0	1	1	0
Hispanic	0	1	1	0	0	1	1	0	1	1
Asian non-Hispanic	3	5	3	4	5	2	3	4	4	3
American Indian/ Alaskan Native	0	0	0	0	0	0	0	0	0	0
Foreign	20	17	13	17	15	20	17	16	16	16
Hawaiian	0	0	0	0	0	0	0	0	0	0
Multiple race	0	0	0	0	0	0	0	0	0	0
Unknown	0	0	0	1	0	0	0	0	0	0
Bachelors Total	71	66	64	72	79	84	99	70	73	80
White non-Hispanic	40	29	30	32	36	39	55	33	33	38

Black non-Hispanic	1	2	2	0	0	3	0	1	1	1
Hispanic	1	1	5	3	6	4	4	3	4	4
Asian non-Hispanic	14	22	13	18	14	14	11	16	16	14
American Indian/ Alaskan Native	1	1	0	1	1	0	0	1	1	0
Foreign	13	10	11	12	17	20	25	13	14	17
Hawaiian	0	0	1	0	0	0	0	0	0	0
Multiple race	0	0	1	1	2	1	1	1	1	1
Unknown	1	1	1	5	3	3	3	2	3	3
Associate Total	0	0	0	0	0	0	0	0	0	0
White non-Hispanic	0	0	0	0	0	0	0	0	0	0
Black non-Hispanic	0	0	0	0	0	0	0	0	0	0
Hispanic	0	0	0	0	0	0	0	0	0	0
Asian non-Hispanic	0	0	0	0	0	0	0	0	0	0
American Indian/ Alaskan Native	0	0	0	0	0	0	0	0	0	0
Foreign	0	0	0	0	0	0	0	0	0	0
Hawaiian	0	0	0	0	0	0	0	0	0	0
Multiple race	0	0	0	0	0	0	0	0	0	0
Unknown	0	0	0	0	0	0	0	0	0	0

Note: Includes all active program matching majors among 4 possible major codes.

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

Employment of Majors*							
	Average Salary	Employ-ment % In state	Employment % in the field	Employment: % related to the field	Employment: % outside the field	No. pursuing graduate or profes-sional educa-tion	Projected growth from BLS** Current year only.
Year 1 (2015)	$83,590	86%	100%			2.2%	
Year 2 (2016)	$84,190	86%	100%			2.2%	
Year 3 (2017)	$84,620	86%	100%			2.2%	5% in 10 years (2012-2022)

* 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)

- Provide a brief assessment of student need and demand using the data from tables 11-15 from the Office of Planning and Analysis and from the table above. Include the most common types of positions, in terms of employment graduates can expect to find.

  Provide assessment here:

From Table 11, it can be noticed that during 2015-2017, the number of applicants to the ME undergraduate program increased by a large number in each year during this period. The 5-year rolling average of number of applications also increased steadily during this period. The number of undergraduate admissions are quite close to the number of applications, indicating a large acceptance rate of over 95%. However, the percent of undergraduate admitted students that enrolled in the program is in the range of 40% to 58% during 2015-2017. In the graduate programs, the number of applicants dropped in 2016 and then rise in 2017. The acceptance rate in the graduate programs were 58% in 2015, 53% in 2016, and 55% in 2017. During 2015-2017, 23-41% of the admitted graduate students enrolled in our programs.

From Table 12, it can be seen that the 5-year rolling average of percent under-represented minorities increased in the department as well as in the college and the university. The ME department numbers are larger compared to the College of Engineering but smaller than the university. The college has initiated greater emphasis on minority recruitment programs and the ME department plans to take advantage of those measures to further increase minority student population. Table 13 shows that there is a good spread of participation from different race/ethnic background in our student population. The degrees conferred data presented in Table 14 indicates that Mechanical Engineering Department conferred fewer percent of degrees to underrepresented minorities at both undergraduate and graduate levels compared to the university. This is related to the spread of student population seen in Table 12. We plan to address this by greater recruitment and retention efforts of under-represented minority students in BSME, MSME, and PhD programs. This effort will also include reaching out to different ethnic groups to balance the spread of data shown in Table 15.

In 2016, the median annual wage of mechanical engineers with four year college degree in the US was $84,190 ($70,566 in the State of Kansas). There were over 288,800 mechanical engineering positions in the US in 2016, a rise of nearly 9 percent since last year. Overall, there were 2 jobs as mechanical engineers per 1000 employments. The growth rate in mechanical engineering jobs from 2012-2022 is anticipated to be around 5 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 13 percent during the last six years. The number of BSME degrees annually awarded at WSU has increased by 39 percent during that same period. ME department has hired a full-time Undergraduate Student Success Advisor in Spring 2015 to improve the quality of student advising and increase retention. 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.

5. **Analyze the 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).**

Evaluate table 16 from the Office of Planning Analysis for SCH by student department affiliation on fall census day.

Table 16: Department Student Credit Hour (SCH) by Student Department Affiliation on Fall Census Day

	Year of Fiscal Census Day							Rolling 5 year average		
Major & Student Level	2010	2011	2012	2013	2014	2015	2016	2010-2014	2011-2015	2012-2016
Total	2988	2905	2633	3117	3772	4365	4551	3083	3358	3688
Program UG majors	1935	1763	1649	1945	2336	2937	3287	1926	2126	2431
Program GR majors	437	421	428	423	609	611	498	464	498	514
Non-Program majors	616	721	556	749	827	817	766	694	734	743
Total	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Program UG major	64.8%	60.7%	62.6%	62.4%	61.9%	67.3%	72.2%	62.5%	63.3%	65.9%
Program GR major	14.6%	14.5%	16.3%	13.6%	16.1%	14.0%	10.9%	15.0%	14.8%	13.9%
Non-Program majors	20.6%	24.8%	21.1%	24.0%	21.9%	18.7%	16.8%	22.5%	21.9%	20.1%

Note: Includes all active program matching majors among 4 possible major codes.

a. Provide a brief assessment of the 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.

Provide assessment here:

The Mechanical Engineering Department generated 4365 SCH in 2015 and 4551 SCH in 2016. From 5-year rolling average data, the SCH generation is gradually increasing at a rate of approximately 9.4%. ME undergraduate majors contribute to approximately 66% of SCH, ME graduate majors contribute approximately 14% of SCH, and the remaining

20% comes from the non-program majors. The department offers service courses to the college through the following courses: ME 398 – Thermodynamics I, ME 250 – Materials Engineering, and ME 251 – Materials Engineering Laboratory. In addition, several other departmental courses are also taken by students from aerospace, industrial, electrical, and bioengineering to satisfy their technical elective requirements.

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
	1. Enhance inter-disciplinary academic and research programs.	ME faculty developed research collaborations with faculty members in Industrial Engineering, Biomedical Engineering, Electrical and Computer Engineering, Chemistry, and Biology. No interdisciplinary academic program has been developed yet.	Partially achieved this goals and plans to work on it in the future.
	2. Enhance funding to support graduate programs.	All tenure-track faculty hired by the department have been offered lower teaching load for 2 years to help secure externally funded research projects to enhance ME graduate programs. Senior faculty members also contributed towards development and submission of research proposals to secure external research funding. These efforts have resulted in a substantial increase in research funding to $1,375,500 in 2017.	Successfully achieved this goal.
	3. Enhance the size of graduate student population and recruitment of under-represented minorities.	The average enrollment in the MSME program during 2015-2017 was 8% higher compared to 2012-2014. The average enrollment in the PhD program during 2015-2017 was 16% higher compared to 2012-2014. ME department conferred 78 MSME degrees and 10 PhD degrees during 2015-2017. The department was able to significantly increase percent of minority enrollment in both undergraduate and graduate programs in each year during 2015-2017.	Successfully achieved this goal.

	4. Enhance design and research experience of undergraduate students.	The participation of Mechanical Engineering students in Co-Op and Internship programs with industry was significantly higher than any other department within the College of Engineering in each year during 2015-2017. Also the number of students actively participating in research with faculty increased quite significantly in the period 2015-2017. A good number of these students presented papers in professional conferences on their research results which is quite praiseworthy.	Successfully achieved this goal.
	5. The plans and measures for continuous assessment will be developed and implemented.	Assessment is being done continuously.	Achieved this goal.
	6. New hybrid models of teaching that take advantage of online teaching will be developed.	ME department offered ME 250: Materials Engineering in online format in Fall 2017 semester. The department also developed 6 online Badge courses on Computational Methods that are being offered starting Spring 2018 semester.	Successfully achieved this goal.
	7. The department will implement a training scheme/support for adjuncts and GTAs.	GTAs are supervised by regular faculty, however no formal training program has been developed. The department was fortunate to have adjuncts who had good teaching experience and expertise in the field they taught; therefore no formal training was needed.	Partially achieved this goal and plans to work on further improvement.

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.

Provide assessment here:

Strengths:

1. The department has a very large undergraduate program (over 550 students).
2. The department has a significant size graduate program (over 100 students).
3. The faculty is quite productive in terms of research, publication, and service.
4. Much of the research performed by the faculty is multi-disciplinary in nature.
5. Most undergraduate students gain co-op/internship experience.
6. The faculty areas of specialty in research and teaching are diverse.
7. Students have ready access to faculty.
8. There are active student professional organizations supported by the department.
9. Every undergraduate student has experience with an industry-based capstone design project.

Weakness:

1. The operating budget and the resources available for faculty development are quite low compared to the size of undergraduate and graduate student population that the department supports.
2. Startup package and salary are limited compared to other 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.

Opportunities:

1. With the improvements in the economy of the State and nation, the demand for mechanical engineering graduates will increase.
2. The local, state, and nationwide industry is implementing continuous improvement strategies which may make use of faculty research capabilities.

Threats:

1. The growth of the department's undergraduate program may be limited by a lack of laboratory facilities (equipment and space).
2. The growth of the department's graduate programs may be limited by a lack of funding for GTA support and laboratory space.
3. The budget cut towards funding for higher education in the State of Kansas could pose a threat to the adequate resources for education of engineers.

Plan/Goals (To be met prior to AY 2021/2022):

1. Enhance inter-disciplinary academic and research programs.
2. Enhance funding to support graduate programs.
3. Enhance the size of graduate student population.
4. Enhance the size of undergraduate student population.
5. Enhance the recruitment of under-represented minorities.
6. Enhance design and research experience of undergraduate students.
7. Develop and Implement plans and measures for continuous assessment.

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 contribute 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 December 2017 and currently followed by the program, are as follows:

- PEO-1: Educate students to be successful mechanical engineers with emphasis on sustainability, affordability, and globalization.
- PEO-2: Prepare students to pursue life-long learning.
- PEO-3: Prepare students for real-world problems through applied learning and industry-based projects for diverse and dynamic environment.

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

Constituencies	Input
Faculty	Formal, documented discussion
Industry	Advisory committee meetings Feedback on Senior project activities
Alumni	Alumni survey results Documented anecdotal information
Students	Exit Surveys, informal surveys

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.

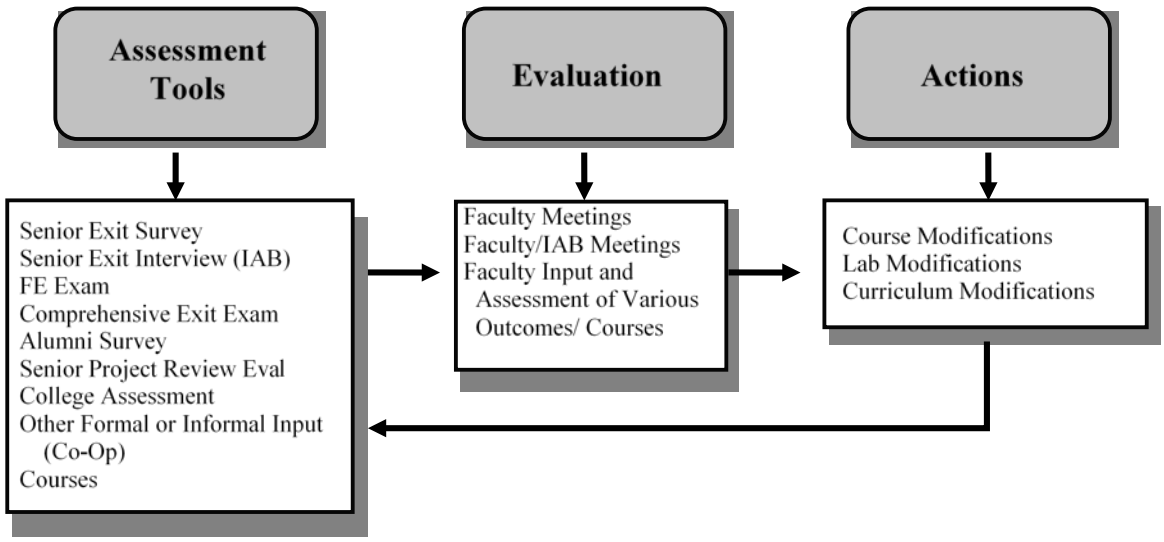

Figure A.1 Development of Assessment Process

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

PROGRAM EDUCATIONAL OBJECTIVES* (relating ABET Outcomes and Assesment 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 Student 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
FE Exam	X		X		X	X					X
Comprehensive Exit Exam	X		X		X	X					X
Senior Exit Survey	X	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: Educate students to be successful mechanical engineers with emphasis on sustainability, affordability, and globalization.
- PEO-2: Prepare students to pursue life-long learning.
- PEO-3: Prepare students for real-world problems through applied learning and industry-based projects for diverse and dynamic environment.

Table A.3 Relationship of Curriculum and Student 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								•		•	

Curriculum Courses/Outcomes											
ABET Criterion	(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)	(k)
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	●		●		●	●	●		●	●	●
ME 631 Heat Exchanger Design	●		●		●	●	●		●	●	●
ME 750A Deign of Thermla Systems	●		●		●	●	●		●	●	●
ME 750E Deign of Heat Exchangers	●		●		●	●	●		●	●	●
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 732 Injury Biolmechanics	●				●			●	●		●
ME 750 B Nanocomposites	●			●				●			●
ME 750 C Nanomaterial Studies	●			●				●	●		●
ME 760 Fracture Mechanics	●		●		●			●			●
ME 762 Polymeric Composite Materials	●		●		●		●				●

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

Learning Outcomes	Assessment Tool	Target/Criterion	Average 2012-14 Results
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	50% 3.5/5.0	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%	93.5%
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	93.5% 100%

BSME graduates will attain: (d) An ability to function on a multidisciplinary team.	➢ Capstone Design: Team Member Peer Evaluations	85%	95.2%
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	97.2% 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	97.2% 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%	3.9/5.0 100%
BSME graduates will attain: (i) A recognition of the need for, and an ability to engage in, life-long learning.	➢ ME Senior Chair Survey	3.0/5.0	4.6/5.0
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% 3.9/5.0

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.

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 graduate level courses that have writing and presentation components.
- Presentation skills will be assessed via graduate level courses that have presentation component.

(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

Learning Outcomes	Assessment Tools	Target/Criterion	Average 2012-14 Results
(a) MSME graduates will have an ability to self-educate	➢ Research projects in courses	80%	85%
(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%	83%
(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%	100%

(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%	90%
(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%	100%

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 is 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 graduate level courses that have writing and presentation components.
   - Presentation skills will be assessed via graduate level courses that have presentation component.

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 PhDME program are provided in Table C.1.

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

Learning Outcomes	Assessment Tools	Target/Criterion	Average 2012-2014 Results
(a) PhDME graduates will have an ability to self-educate and to conduct independent scholarly research.	➢ Rubric score on dissertation ➢ Research projects in courses	80%	90%
(b) PhDME graduates will have effective oral and written communication skills.	➢ Writing skills via assignments and projects in the graduate level courses that have writing component; and dissertation ➢ Presentation skills via graduate level courses that have presentation component; and dissertation defense	80%	90%
(c) PhDME graduates will have competency in one of the core, as well as their major and minor areas.	➢ 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%	100%

(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%	100%
(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%	100%

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.