WICHITA STATE UNIVERSITY

Program Review Self-Study Template

Academic unit: Industrial and Manufacturing 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 Industrial Engineering __________ CIP* code: 14:35________

Degree: BS Engineering for Manufacture __________ CIP code: 14:36 ________

Degree: MS Industrial Engineering __________ CIP code: 14:35 ________

Degree: MEM Engineering Management __________ CIP code:______________

Degree: PhD Industrial Engineering __________ CIP code: 14:35__________

*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
Esra Buyuktahtakin (Assistant Professor)	
Nils Hakansson (Assistant Professor)	
Michael Jorgensen (Associate Professor)	
Krishna K Krishnan (Chair & Professor)	
Vis Madhavan (Professor)	
Anil Mahapatro (Assistant Professor)	
Don Malzahn (Professor)	
Janet Twomey (Professor)	
Pingfeng Wang (Assistant Professor)	
Gamal Weheba (Associate Professor)	
Lawrence E. Whitman (Professor)	
Mehmet Bayram Yildirim (Associate Professor)	

Submitted by: Krishna K Krishnan (Chair & Professor) ____________ 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 mission of the BS in Industrial Engineering program is to prepare students through an experiential education to design, model, analyze, and manage modern complex systems in order to increase the effectiveness of manufacturing and service sector organizations.

The mission of the BS in Engineering for Manufacture program is to prepare students through an experiential education to design, model, analyze, and manage modern manufacturing materials and processes in order to increase the effectiveness of industrial organizations.

The mission of the MS in Industrial Engineering program is to enhance the skills of degreed engineers by providing advanced knowledge and skills that are needed to design, model, analyze and manage modern complex systems in order to increase the effectiveness of manufacturing and service sector organizations.

The mission of the Master's in Engineering Management program is to enhance the skills of degreed engineers which will increase their effectiveness in planning, decision making, complex problem solving, and managerial skills, while receiving advanced technical knowledge, in order to increase the effectiveness of manufacturing and service sector organizations.

The mission of the PhD program in Industrial Engineering program is to provide training education for degreed engineers to perform research and advance the knowledge in the areas of Systems Engineering, Manufacturing Engineering, and Ergonomics.

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

The role of the BS in Industrial Engineering program is to provide an undergraduate education to its students that will prepare the graduates to:

1. Be employed in jobs related to designing, modeling, analyzing, and managing modern complex systems, implementing and improving systems in manufacturing and service sectors at local, regional, national and global levels,
2. Pursue life-long learning, such as graduate studies and research, certification from professional organizations, Fundamentals of Engineering Certification, Professional Engineering License, etc., and

3. Achieve professional success through the program's emphasis on experiential learning through solving real world problems.

The role of the BS in Engineering for Manufacture program is to provide an undergraduate education to its students that will prepare the graduates to:

1. Be employed in jobs related to design, model, analyze, and manage modern manufacturing materials and processes, implementation and improvement of systems in manufacturing and service sectors in local, regional, national and global levels,

2. Pursue life-long learning, such as graduate studies and research, certification from professional organizations, Fundamentals of Engineering Certification, Professional Engineering License etc., and

3. Achieve professional success through the program's emphasis on experiential learning through solving real world problems.

The role of the MS in Industrial Engineering program is to provide a graduate education to its students that will prepare the graduates to:

1. Be employed in jobs related to design, model, analyze, and manage modern manufacturing materials and processes, implementation and improvement of systems in manufacturing and service sectors in local, regional, national and global levels. Pursue life-long learning, such as graduate studies and research, certification from professional organizations, FE/PE etc., and

2. Achieve professional success through the program's emphasis on experiential learning through solving real-world problems.

The role of the Master's in Engineering Management program is to provide a graduate education to its students that will prepare the graduates to:

1. Be employed in jobs related to design, model, analyze, and manage modern manufacturing materials and processes, implementation and improvement of systems in manufacturing and service sectors in local, regional, national and global levels. Pursue life-long learning, such as graduate studies and research, certification from professional organizations, FE/PE etc., and

2. Achieve professional success through the program's emphasis on experiential learning through solving real world problems.

The role of the PhD in Industrial Engineering program is to provide a graduate education to its students that will prepare the graduates to:

1. Be employed in jobs related to design, model, analyze, and manage modern manufacturing materials and processes, implementation and improvement of systems in manufacturing and service sectors in local, regional, national and global levels. Pursue life-long learning, such as graduate studies and research, certification from professional organizations, FE/PE etc., and

2. Achieve professional success through the program's emphasis on experiential learning through solving real world problems.

The role and mission of the IME department are consistent with the mission of the college of engineering and Wichita State University. There have been changes to the role statements for the BS, MS and PhD program in Industrial Engineering since the last assessment. All of them have been modified to include the needs of service sector organizations such as hospitals and financial sector industries. The second role statement was modified to ensure that the department's objectives are in alignment with the university's and college's mission of experiential learning. Thus there is an emphasis on case studies and real world problem solving in the education of our graduates. This experience includes two industry-based semester-long capstone design projects in the undergraduate programs. Organizations such as: Girls Scouts of America, Red Cross, WSU Admissions Department, Office of Research Administration, and the local hospitals have also sponsored projects. At the graduate level, there will be more emphasis on industry based class projects.

d. Has the mission of the Program (s) changed since last review? ☒ Yes ☐ No
   i. If yes, describe in 1-2 concise paragraphs. If no, is there a need to change?

   The mission statements for the BS in Industrial Engineering, MS in Industrial Engineering, Master's in Engineering Management, and the PhD in Industrial Engineering has been changed to reflect the broadened focus on service sector jobs as well as manufacturing sector jobs.

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). Have they changed since the last review? ☐ Yes ☒ No
   If yes, describe the changes in a concise manner.

Undergraduate Programs
The BS in Industrial Engineering program focuses on the design, analysis, improvement, and management of systems in manufacturing and service organizations. Industrial engineers bridge the gap between management and operations while emphasizing process improvement. Industrial engineers are unique in engineering as they also take into consideration the human element in the design of these systems. The department's BS in Industrial Engineering program includes 128 credit hours of required course work. The program is designed such that the students can complete their degree in 4 years. The program consists of general education, core areas in engineering, required courses in the industrial engineering, and four 3-credit hour technical electives. The students also complete two industry-based senior design projects over the last two semesters of their study. The senior design projects are evaluated by industry and faculty.

The BS in Industrial Engineering Program Educational Objectives (PEOs) is aimed to ensure that the Program graduates will:

1. Be employed in jobs related to design, implementation and improvement of systems in manufacturing and service sectors
2. Pursue life-long learning, such as graduate studies, certification from professional organizations, Fundamentals of Engineering Examination, Professional Engineering Licensure, etc. and
3. Achieve professional success through the program's emphasis on solving real world problems in industries and organizations in the Wichita metropolitan area.

The BS in Engineering for Manufacture program equips graduates with engineering methods, skills and experience required to develop and improve manufacturing processes and systems. A blend of coursework from Industrial and Mechanical Engineering curriculum prepares graduates of this program to apply both deterministic and statistical analysis to identify problems and improve metrics such as productivity, quality, reliability, cost, waste, and sustainability. The department's BS in Engineering for Manufacture program includes 128 credit hours of required course work. The program is designed such that the students can complete their degree in 4 years. The program consists of general education, core areas in engineering, required courses in industrial engineering, and four 3-credit hour technical electives. The students also complete two industry-based senior design projects over the last two semesters of their study. The senior design projects are evaluated by industry and faculty.

The BS in Engineering for Manufacture Program Educational Objectives (PEOs) is aimed to ensure that the program graduates will:

1. Be employed in jobs related to design, implementation and improvement of systems in manufacturing sectors
2. Pursue life-long learning, such as graduate studies, certification from professional organizations, FE/PE, etc. and
3. Achieve professional success through the program's emphasis on solving real world problems in industries and organizations in the Wichita metropolitan area.

To achieve the PEOs, the department ensures that all BS in Industrial Engineering and BS in Engineering for Manufacture students demonstrate:

i. Engineering/Foundational Knowledge in mathematics, engineering sciences, applied probability, computer science, humanities, and social science
ii. Professional Skills to communicate in both oral and written forms and to be proficient in working in diverse teams of individuals
iii. IE Knowledge/Skills in designing, modeling, optimization, analysis, and evaluation of integrated systems of people technology, and information
iv. Confidence in Engineering and professional skills. (Measured through a confidence survey in senior design course)
v. Understanding of Professional and Ethical Behavior to be prepared for ethical decision making, service to the engineering profession, and have the means to continue in the acquisition of knowledge (

Each semester, for both undergraduate programs, students are required to meet with their advisors before they register for. During this consultation, the student's records file is available. Also at this time, lists of approved elective courses in humanities and fine arts, social and behavioral sciences, natural sciences, and in-department and out-of-department technical electives are available. Through the use of a computer-generated degree audit and other materials in the file, the advisor ensures that the student is obtaining appropriate credit in engineering design, mathematics, basic science, and humanities and social sciences. In addition, before a student enrolls in the first senior design course (IME 590 Industrial Engineering Design), the undergraduate coordinator checks to ensure that the student is within two semesters of graduation and that he/she has completed the necessary required courses for this course.

Additionally, the department chair performs a graduation check of all seniors in the semester prior when the student is expected to graduate. The chair uses the following check-sheet to ensure that a student will meet all graduation requirements before he/she graduates.

Both the BS in Industrial Engineering program and the Engineering for Manufacture program undergo continuous refinement with input from faculty, students, alumni, and the Industrial Advisory Board. The Program Educational Objectives (PEOs) were refined in 2010 in consultation with the department constituents. The curriculum, lab development and other educational opportunities are analyzed and structured to meet the PEOs of the programs. The PEOs were refined to address the department's expanded focus to include service sector in addition to the manufacturing sector.

Graduate Programs

The Master of Science in Industrial Engineering (MSIE) degree program prepares students for research and design in the areas of Systems Engineering, Manufacturing Engineering, and Ergonomics. Students can complete the degree requirement through any of the following options: thesis, directed project, or all coursework. For the thesis option – the students must complete a minimum of 24 credit hours of coursework (consisting of core courses, major area courses, and technical electives) along with 6 credit hours of research (thesis). The students present a proposal for their research at least 3 months prior to the formal defense of their research work. For the directed project option - the students complete a minimum of 30 credit hours of coursework (consisting of core courses, major area courses, and technical electives) along with 3 credit hours of research (directed project). A formal oral presentation is required to defend and complete the MS project. For the coursework option – the students complete a minimum of 33 credit hours of coursework (consisting of core courses, major area courses, and technical electives). The students complete a terminal activity which can be either a one credit hour seminar or a certification from an external agency as part of the degree requirements.

The department ensures that all MS in Industrial Engineering students have:

1. the technical knowledge in the field of industrial and/or manufacturing engineering and professional skills to get employment and to advance in their field
2. the knowledge and academic background necessary to be accepted to other advanced degree programs
3. the ability to communicate effectively via technical papers and presentations

The Master's in Engineering Management (MEM) degree program is directed towards helping engineers develop planning, decision making, complex problem solving, and managerial skills while receiving advanced technical knowledge. The MEM program is structured for practicing technical professionals to enhance their breadth of knowledge in their specific field into management and business. The MEM program consists of a minimum of 36 credit hours of course work.

The department ensures that all Master's in Engineering Management students have:

1. the technical knowledge in the field of industrial engineering and management and professional skills to get employment and to advance in their field
2. the ability to communicate effectively via technical papers and presentations

The PhD in Industrial Engineering program is directed towards training students to perform research and advance the knowledge in the areas of Systems Engineering, Manufacturing Engineering, and Ergonomics. The PhD program offers tracks in all of the three areas described above. The PhD program consists of an additional 30 credit hours work beyond MS and 24 credit hours of research. The students present a proposal for their research at least 6 months prior to the formal defense of their research work.

The department ensures that all PhD in Industrial Engineering students have:

1. a solid background, technical knowledge in the field of Industrial and/or Manufacturing Engineering, and professional skills to get employment and to advance in their field

2. the knowledge, professional skills, and good publication record in their research area to get employment in academic positions
3. the ability to communicate effectively via technical papers and presentations

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 - BSIE (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→ (2010)	8	8	8.7	0	2.5	4326	41	11
Year 2→(2011)	8	8	7.0	0	2.6	4530	46	13
Year 3→(2012)								
					Total Number Instructional (FTE) – TTF+GTA+O	SCH/ FTE	Majors/ FTE	Grads/ FTE
Year 1→(2010)					11.2	386	--	--
Year 2→(2011)					9.6	472	--	--
Year 3→								

Scholarly luctivity	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 (2009)	5		8		18											9	$762,417
Year 2 (2010)	3		11		30											10	$1,134,537
Year 3 (2011)	15		16		28											20	$1,284,364

* 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.

There are 12 faculty (11 FTE) in the IME department. The 11 FTE positions include two faculty in the Bio-Engineering program. All 12 faculty support the MS in Industrial Engineering program and the PhD in Industrial Engineering Program. The Master's in Engineering Management is supported by 5 faculty. Although four of the programs are supported reasonably well, there is only one faculty in the area of manufacturing. This has impacted the number of undergraduate students enrolling in the Engineering for Manufacture program. There are plans to hire one more faculty to support Engineering for Manufacture program. In addition, adjuncts with expertise in appropriate areas are hired to teach on a regular basis to support the programs.

The faculty published 5, 3, and 15 journal papers in 2009, 2010, and 2011 respectively. The faculty also published 18, 30 and28 conference proceedings in 2009, 2010, and 2011 respectively. The faculty was also active in presentations without proceedings with 8 in 2009, 11 in 2010 and 16 in 2011. The IME faculty has 15 journal papers accepted in 2011 and 22 in review. The IME faculty also completed 8 final contract reports in 2011. The IME faculty has 20 new funded proposals for a total of $1,284,364. The total funding generated by the faculty in 2010 from 10 proposals is $1,134,537. The total funding generated in 2009 was $762,417. The IME faculty provided about $273,706 in support for graduate students in 2009, $296,761 in 2010, and $270,281 in 2011. Thus, the IME faculty have continued to increase the number of journal papers, conference papers, the number of research proposals funded, and amount of money generated through research funding, while maintaining steady the amount of funding to graduate students.

In addition to the above, the IME faculty are actively involved in the college and University activities. As Chair, I am proud to say that the IME faculty makes invaluable service contributions to the college and the university. They continue to be active in leading the Bioengineering initiative, engineering education initiative, setting up the engineering technology program, and a host of other activities with the college and the university. The co-chairs (Dr. Malzahn and Dr. Twomey) of the College of Engineering strategic committee are from the IME department.

IME faculty are also making headway in service to the profession at the national level. This is important to the department as these activities lead to more visibility and recognition for the department nationally.

- In 2010, Dr. Whitman was the chair of the Industrial Engineering division of the American Society for Engineering Education and the Vice-Chair of the International Federation of Automatic Control Technical Committee 5.3 Enterprise Integration and Networking.
- In 2011, Dr. Twomey has been selected to be the Associate Vice-President for Institute for Industrial Engineers (IIE).
- Dr. Whitman is the technical Vice-President for IIE.
- Dr. Krishnan served as a member of the "IIE Curriculum and Innovations in Teaching" committee and has been selected to chair the committee in 2012.
- Dr. Krishnan is also the Chair-Elect for the "New Faculty Colloquium" at the IIE Research conference.
- Dr. Krishnan serves as an ABET Evaluator
- Dr. Wang is the chair for the Webinar committee for Institute of Electrical and Electronics Engineers Reliability Society.
- Dr. Buyuktahtakin is the secretary for the INFORMS Junior Faculty Interest group.
- Five faculty are on editorial board of journals.

The department supports the faculty by providing travel support for faculty who bring recognition to the department.

The faculty have been active in teaching, research and service. While some faculty have published more than others, other faculty have focused more on research grants. Based on the faculty evaluations for the last three years, the faculty have consistently met the teaching requirements. In cases, where research and service requirements were not satisfactory, the teaching loads are adjusted to reflect the reduced activity levels in research and service.

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.

UG Program - BSEM

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	20	3
Year 2→	*	*	*	*	*	N/A	22	2
Year 3→	*	*	*	*	*	N/A		
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 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																	
Year 2																	
Year 3																	

* 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 undergraduate 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.

   For a detailed assessment of faculty, please refer to section 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.

Master of Science in Industrial Engineering

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	101	30
Year 2→	*	*	*	*	*	N/A	102	28
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 luctivity	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																	
Year 2																	
Year 3																	

* 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.

b. 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.

2d. 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.

Masters in Engineering Management

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	20	3
Year 2→	*	*	*	*	*	N/A	19	4
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 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																	
Year 2																	
Year 3																	

* 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.

2e. 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 in Industrial Engineering 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	13	4
Year 2→	*	*	*	*	*	N/A	20	1
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 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																	
Year 2																	
Year 3																	

* 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).

b. 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)		
	IE	EM	[redacted]	IE	EM	All University Students - FT
Year 1→	41	20		26.1	23.5	22.66
Year 2→	46	22		25.6	24.4	22.72
Year 3→						22.81

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

c. 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 ≥54 hr reported) By FY						
	Master Degrees		PhD	GPA			Comparisons			
	MSIE	MEM	IE	MSIE	MEM	PhD	College – MS	College – PhD	Univ - MS	Univ PhD
Year 1→	93	28	18	3.34	2.99	3.68	3.33	3.51	3.48	3.62
Year 2→	100	36	35	3.34	3.30	3.57	3.36	3.57	3.48	3.62
Year 3→	65	25	17	3.23	3.25	3.50	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.

Each course in the Industrial and Manufacturing Engineering department has clearly identified learner outcomes communicated in the syllabus.

Undergraduate Programs

At the undergraduate level, the Accreditation Board for Engineering and Technology (ABET) criterion are used as part of assessment. Based upon the ABET accreditation process, the student learning outcomes are assessed by measuring and ensuring that each undergraduate student in the BS in Industrial Engineering program has:

a. An ability to apply math, science, and engineering knowledge
b. An ability to design/conduct experiments as well as to analyze and interpret data
c. An ability to design system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability
d. An ability to function on multi-disciplinary teams
e. An ability to identify, formulate, and solve engineering problems
f. An 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, economic, environmental 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

IE 1. Knowledge in core IE areas

IE 2. Knowledge in broad areas

In order to assess the full range of ABET learning outcomes; assessments were allocated to specific courses. The allocations were made such that each outcome was assessed in multiple courses and each core course assessed multiple outcomes, Table 1.

Table 1 Allocation of ABET a-k student outcomes to specific required courses for the Industrial Engineering program.

Course Coordinator	DM	MJ	BY	LW	GW	JT	KK	JT	VM	DM	
IE											
Program Outcome	452	549	550	553	554	556	563	565	258	Sr Design	Mean
a. Apply Math/Science /Engineering Knowledge			X	X						X	X
b. Design/conduct experiments		X			X			X		X	X
c. Design system/comp.	X						X			X	X
d. Function on teams									X	X	X
e. Solve Engr. Problems	X		X				X			X	X
f. Professional/ethical responsibility		X								X	X
g. Communicate	X					X		X		X	X
h. Global/Social Context				X						X	X
i. Life-long learning					X					X	X
j. Contemporary Issues		X		X						X	X
k. Engineering Practice			X							X	X
IE 1. Develop, implement, and improve integrated systems	X	X	X	X						X	X
IE 2. Integrate systems using appropriate analytical, computational, and experimental practice					X	X	X			X	X

Each course reported the assessment of specific learning outcomes using a standard format, Table 2. Table 2 shows that each learning outcome was assessed multiple times in multiple forms in this course. The performance is the ratio of points earned to total point available for the specific measure.

Table 2 An example of learning outcome assessment assigned to a specific course (IME 452). Similar assessments re available for each course each semester.

Specific assessment instrument	Program Outcome Assessed (a-k)					
	c		d		1	
	Earned	Out of	Earned	Out of	Earned	Out of
Quiz #1			15	20		
Exam #1 (2 Questions)			26	30		
Project #1	37	50	37	50		
Project #2	32	50				
Exam #2 (1 Question)	12	15	12	15		
Quiz #4	16	20				
Term Project	78	100				
Exam #3 (3 Questions)	24	30				
All Individual Assessments					532	650
Column Total	199	265	90	115		
Program Outcome Assessment (0-100%)	75.1		78.3		81.2	

An identical process is used to assess learning outcomes for the Engineering for Manufacture program with a change in the program specific outcomes at the end of the list.

Based upon the ABET accreditation process, the learning outcomes are assessed by measuring and ensuring that each undergraduate student in the BS in Engineering for Manufacture Industrial Engineering program has:

a. An ability to apply math, science, and engineering knowledge
b. An ability to design/conduct experiments as well as to analyze and interpret data
c. An ability to design system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability
d. An ability to function on multi-disciplinary teams
e. An ability to identify, formulate, and solve engineering problems
f. An 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, economic, environmental 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

ME 1. Knowledge in materials and manufacturing processes
ME 2. Knowledge in process, assembly, and product engineering
ME3. Knowledge of manufacturing competitiveness
ME4. Knowledge of manufacturing system design

Although these assessments provide important information for accreditation purposes, we found that there were significant standard errors of measurement due to the relatively small sample sizes. Program student learning objectives were defined at a higher level an incorporated all of the previous formal assessments plus some information from a senior exit survey.

The assessed learning outcomes for the BS in Industrial Engineering and Engineering for Manufacture program are:

i. Engineering/Foundational Knowledge in mathematics, engineering sciences, applied probability, computer science, humanities, and social science (BS IE - ABET student learning outcomes a, b, c, e, IE2) and (BS EM - ABET a, b, c, e, ME3, ME4)
ii. Professional Skills to communicate in both oral and written forms and to be proficient in working in diverse teams of individuals (Abet d, g, j, k)
iii. IE Knowledge/Skills in designing, modeling, optimization, analysis, and evaluation of integrated systems of people technology, and information (BS IE - ABET - IE1) and (BS EM - - ABET ME1, ME2)
iv. Confidence in Engineering and professional skills. (Measured through a confidence survey in senior design course)
v. Understanding of Professional and Ethical Behavior to be prepared for ethical decision making, service to the engineering profession, and have the means to continue in the acquisition of knowledge (ABET - f, h, i, j)

Table 3 illustrates the allocation of ABET outcome to program assessment learning outcomes for the 2012 academic year.

Table 3. Distribution of ABET learning outcome to the broader program assessment learning outcomes.

Performance from program a-k	Measure	Engineering Knowledge	Professional Skills	Industrial Engr Knowledge/Skills
a. Apply Math/Sc/Engr Knowledge	75	75		
b. Design/conduct experiments	80	80		
c. Design system/comp.	80	80		
d. Function on teams	90		90	
e. Solve Engr. Problems	80	80		
f. Professional/ethical responsibility	100		100	
g. Communicate	83		83	
h. Global/Social Context	72		72	
i. Life-long learning	76		76	
j. Contemporary Issues	77		77	
k. Engineering Practice	81		81	
IE 1. Knowledge in core IE areas	89		89	89
IE 2. Knowledge in broad areas	72	72		
MEAN		**77**	**84**	**89**

Confidence from Exit Survey	Measure	Confidence in Engineering Skills	Confidence in Professional Skills
Basic Science	62	62	
Mathematics	72	72	
Probability	76	76	
Engr. Science	65	65	

Engr Design	71	71	
Engr. Prof & Ethical Stdr	81		81
Team Work	87		87
Socio-Economic	75		75
MEAN		**69**	**81**

Feedback Loop:
In addition to the ABET based outcome assessment, some courses conduct a prerequisite assessment to assess the skills of incoming students. There is also a core competency exam administered to each graduating senior, an assessment by a panel of each capstone design project, and an anonymous exit survey assessing student perceptions of their abilities and the quality of their educational experience. The department's Curriculum and Assessment Committee assesses the results of the measures and may perform additional studies. Issues may be identified and recommendations made to the faculty meeting as a committee of a whole. These assessments are the basis for the continued development of a more effective faculty. As part of one of the Industrial Advisory Board meetings each year, a summary of all assessments and the resulting actions are presented and the feedbacks from the discussions are incorporated in the changes that are implemented.

Criterion /Target for assessment
The target level for achievement is set at 80% for individual ABET outcomes as well as for the learning outcomes identified for the program. The target level is reviewed by the department curriculum committee periodically. The 30% value was chosen based upon the nature of the individual items used in courses as the basis for assessment. These are typically items that are very discriminating in terms of competency and thus do not include the easier elements that may makeup some elements of homework assignments or some test questions.

Result
A comparison of the summary performance on five program assessment learning outcome is made for the current period with respect to historical averages. We found this measure to be much more stable and provide better insight asd to the effectiveness of the programs, Figure 1,

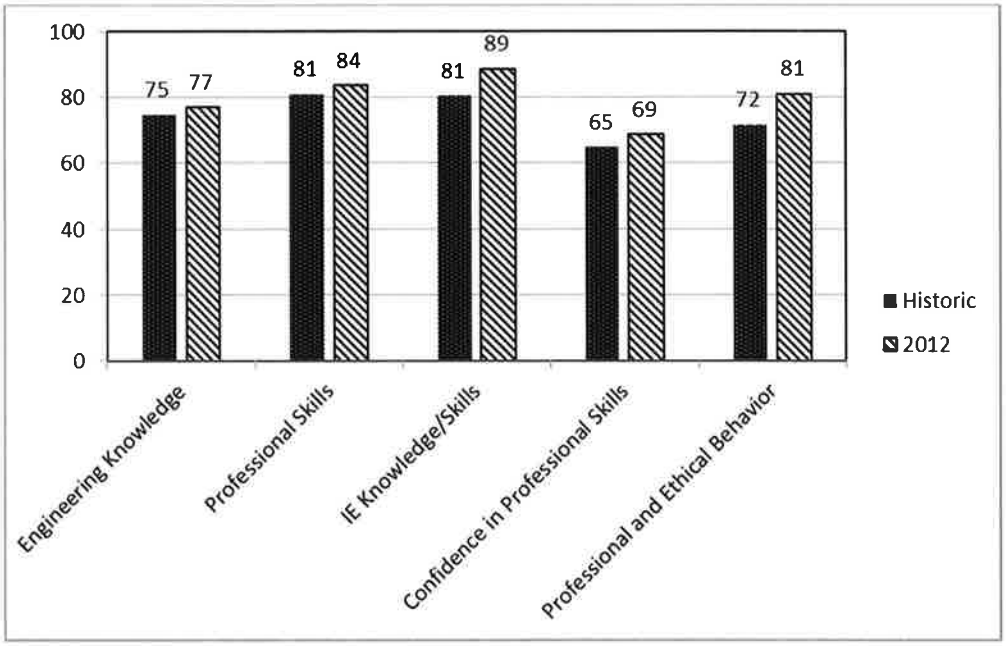

Figure 1 Comparison of program assessment learning outcomes for the 2012 academic year.

Table 3 summarizes the assessment of program learning objectives. "Competence in applying engineering knowledge" and "Self-confidence in applying professional skills" are below target levels. Although both are not at a desired level, there has been positive change. There have been conscientious efforts to increase the experiential and project based learning in the curriculum and they appear to be having an impact.

Table 3. Data Collected for the BS in Industrial Engineering and Engineering for Manufacture Program (2012 Spring)

Learner Outcome	Assessment Tool	Target/Criterion	Result See Figure 1
Graduates will demonstrate competence in applying engineering knowledge.	Class assessments and project assessments collected as part of ABET accreditation	80%	77% Does not meet expectations but has positive trend
Graduates will demonstrate competence in applying Professional skills	Class assessments and project assessments collected as part of ABET accreditation	80%	84% Meets expectation
Graduates will demonstrate competence in applying Industrial Engineering knowledge/skills	Class assessments and project assessments collected as part of ABET accreditation	80%	89% Meets expectation
Graduates will demonstrate self-confidence in applying professional skills	Formal exit survey	80%	69% Does not meet expectation but positive trend
Graduates will demonstrate an understanding of professional an ethical behavior	Class assessments and project assessments collected as part of ABET accreditation	80%	81% Meets expectation

Graduate Programs

The goals of the MS in Industrial Engineering program is to ensure that graduates have:

1. the technical knowledge in the field of industrial and/or manufacturing engineering and professional skills to get employment and to advance in their field (measured by learner outcomes – i, iii, iv, and v)
2. the technical knowledge, and academic background necessary to be accepted to other advanced degree programs (measured by learner outcomes – i, iii, iv, and v)
3. the ability to communicate effectively via technical papers and presentations(measured by learner outcomes – ii)

The MS in Industrial Engineering program goals will be assessed on an annual basis using the following measures:

1. At least 80% of the MSIE graduates will be employed or admitted to another advanced degree program in six months after graduation
2. Program goals 1 and 2 will also be assessed through the graduate curriculum using learner outcomes i, iii, iv, and v.
3. Program goal 2 will also be measured through publications resulting from research.

Learner outcomes and assessment details for the MS in Industrial Engineering are provided in Table 4.

The IME Department will develop a mapping of individual learner outcomes for each course at the graduate level to the program objectives.

Table 4. Learner outcomes and assessment for the MS in Industrial Engineering

Learner Outcome	Assessment Tool	Target/Criterion	Result
Graduates will have an ability to self-educate.	-rubric score on MS project or MS thesis -research projects in courses	80%	N/A
Graduates will communicate effectively	writing skills - via assignments and projects in the required technical writing class CESP750D; graduate level courses that have writing component; and thesis or project Presentation skills - via graduate level courses that have presentation component; and thesis or project	80%	N/A
Graduates will have competency in core areas of on production control, ergonomics, statistics and probability, and optimization	Graduates will be assessed for several course learner outcomes while taking the core classes on production control, ergonomics, statistics and probability, and optimization; graduates will be assessed via prerequisite quizzes in the classes which utilize the concepts developed in the core classes.	80%	N/A
Graduates will be able to design and improve	Graduates will be assessed for course learner outcomes while taking classes	80%	N/A

systems, components, or processes to meet desired needs	which emphasize design and improvement of engineering systems.		
Graduates will have a knowledge of professional and ethical responsibility	Graduate students will be assessed using Collaborative Institutional Training Initiative CITI integrity modules supported through the Office of Research Administration	80%	N/A

*Explanation for missing data: This is the first year that the IME Department will be assessing the graduate program using the new criteria.

Feedback Loop:

1. 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 enhance faculty availability and attitude.
2. Prerequisite assessment on fundamentals of industrial engineering will be administered in the courses which require core course as prerequisites
3. The departmental graduate committee will review the program outcomes and requirements each semester and recommend changes. Data collection on corrective action will be performed by the graduate committee.

The goals of the Master's in Engineering Management program is to ensure that graduates have:

1. the technical knowledge in the field of Industrial and Management and professional skills to get employment and to advance in their field (measured by learner outcomes i, iii, iv, and v)
2. the ability to communicate effectively via technical papers and presentations (measured by learner outcome ii)

The Master's in Engineering Management program goals will be assessed on an annual basis using the following measures:

1. At least 80% of the graduates will be employed six months after graduation
2. Program goal 1 will also be assessed through the graduate curriculum using learner outcomes i, iii, iv, and v.

Learner outcomes and assessment details for the Master's in Engineering Management program are provided in Table 5.

IME Department will develop a mapping of individual learner outcomes for each course at the graduate level to the program objectives.

Table 5. Learner outcomes and assessment for the Master's in Engineering Management Program

Learner Outcome	Assessment Tool	Target/Criterion	Result
Graduates will have an ability to self-educate.	research projects in courses	80%	N/A

Graduates will communicate effectively	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
Graduates will have competency in core areas Optimization, Engineering Management, Statistics, Decision Processes, Systems Engineering, Quality Engineering, Financial Statement Analysis and Management & Marketing;	Graduates will be assessed for several course learner outcomes while taking the core classes on Optimization, Engineering Management, Statistics, Decision Processes, Systems Engineering, Quality Engineering, Financial Statement Analysis and Management & Marketing; graduates will be assessed via prerequisite quizzes in the classes which utilize the concepts developed in the core classes.	80%	N/A
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
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 IME Department will be assessing the graduate program using the new criteria.

Feedback Loop:

1. 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 enhance faculty availability and attitude.
2. Prerequisite assessment on fundamentals of industrial engineering will be administered in the courses which require core course as prerequisites
3. The departmental graduate committee will review the program outcomes and requirements each semester and recommend changes. Data collection on corrective action will be performed by the graduate committee.

The goals of the PhD in Industrial Engineering program is to ensure that graduates have:

1. a solid background, technical knowledge in the field of Industrial and/or Manufacturing Engineering, and professional skills to get employment and to advance in their field a solid Industrial and/or Manufacturing Engineering background, technical knowledge and professional skills to get employment and to advance in their field
2. the knowledge, professional skills, and good publication record in their research area to get employment in academic positions
3. the ability to communicate effectively via technical papers and presentations

The PhD in Industrial Engineering program goals will be assessed on an annual basis using the following measures:

1. At least 80% of the MSIE graduates will be employed six months after graduation
2. Program goals 1 and 2 will also be assessed through the graduate curriculum using learner outcomes i, iii, iv, and v.
3. Program goal 3 will also be measured through publications resulting from dissertation research.
4.

Learner outcomes and assessment details for the PhD in Industrial Engineering program are provided in Table 6.

The IME Department will develop a mapping of individual learner outcomes for each course at the graduate level to the program objectives.

Table 6. Learner outcomes and assessment for the PhD in Industrial Engineering

Learner Outcome	Assessment Tool	Target/Criterion	Result
Graduates will have an ability to self-educate and do independent research	-rubric score on dissertation -research projects in courses	80%	N/A
Graduates will communicate effectively writing and presentation	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
Graduates will have competency in core, 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	85%	N/A

	classes which utilize the concepts developed in the core classes.		
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
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 IME Department will be assessing the graduate program using the new criteria.

Feedback Loop:

1. 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 enhance faculty availability and attitude.
2. Prerequisite assessment on fundamentals of industrial engineering will be administered in the courses which require core course as prerequisites
3. The departmental graduate committee will review the program outcomes and requirements each semester and recommend changes. Data collection on corrective action will be performed by the graduate committee.

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			1				
2			2				
3			3				

*Available for graduate programs from the Graduate School Exit Survey. Undergraduate programs should collect internally. ± If available.

Student's Assessment of Value of Course

An anonymous survey is used to assess the perceived value of core courses. Each semester the graduating seniors rate the perceived value of each of the core courses in the program (Figure 2)

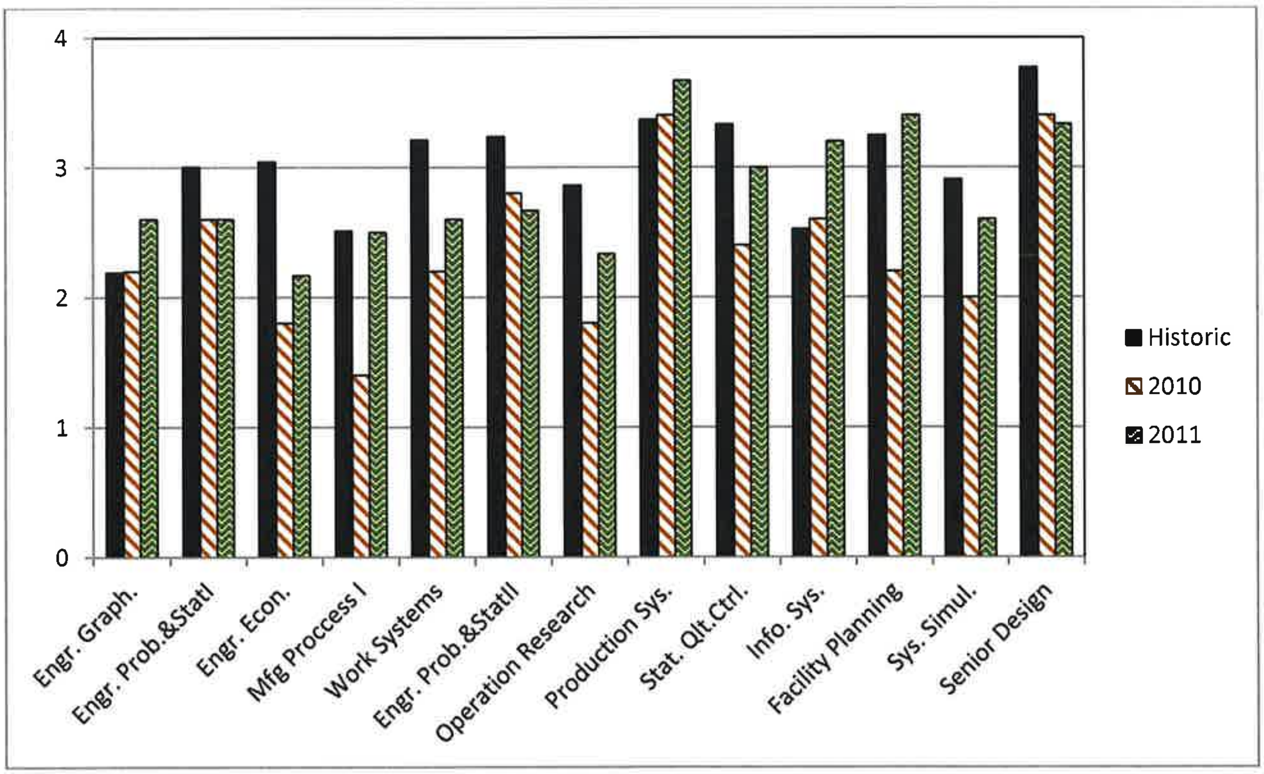

Figure 2. Student perception of course value

Student perception of any specific course shows significant variability indicating the unique nature of each semester's section. These classes are typically small with fewer than 20 students. This small number also contributes to the variability. A general downward trend has been noticed in the perceived value over time. A portion of this may be due to the increasing reliance on adjunct faculty. This year the department has initiated an orientation process for adjuncts with the objective of increasing the perceived value. Also, the programs have untaken an effort to increase the relevancy of laboratory and hands on experiences.

Self-evaluation of Student's Knowledge and Ability

As part of the anonymous survey of graduating seniors, they score their self-confidence in performing fundamental skills required for professional practice. Our objective is for students to feel that they are capable and score themselves at 3 or above. Self-efficacy is particularly important for Industrial and Manufacturing engineers. They are frequently asked to develop and implement solutions to atypical problems involving a wide range of stakeholders and technologies. This requires the confidence to put oneself at risk.

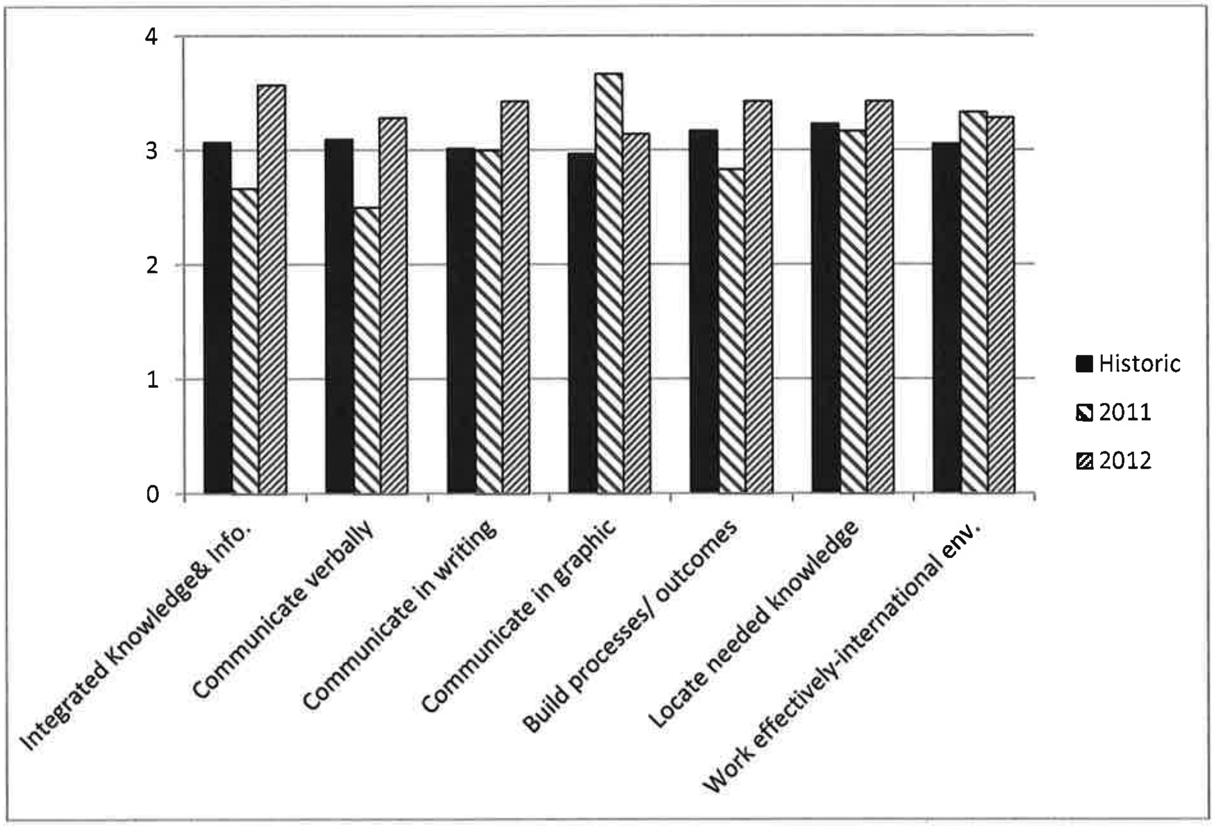

Figure 3. Student self-confidence in ability to perform fundamental tasks of a professional

Figure 3 indicates that there has been a general increase in the level of confidence with the possible exception of "Communicate in graphics." We are examining how to include more graphic communication in upper division courses.

Professional's Assessment of Senior Design Presentation

Each semester, student teams make formal presentations of their semester-long industry-based capstone projects. The audience for these presentations consists of program faculty, the industrial project sponsors, and members of the Industrial Advisory Board. A standard rubric is used by this group to assess projects from the perspective of a practicing professional. The results with comments are compiled and incorporated in the deliberations of the Curriculum and Assessment Committee. Data from the faculty observers are used to graph the results. We found that industry representatives were not able to provide reliable measures but were able to make very perceptive and useful comments. Figure 4 shows these results. It is interesting to note that although students had lower confidence in their communication in graphic ability (Figure 3), this was a more highly rated characteristic of their projects.

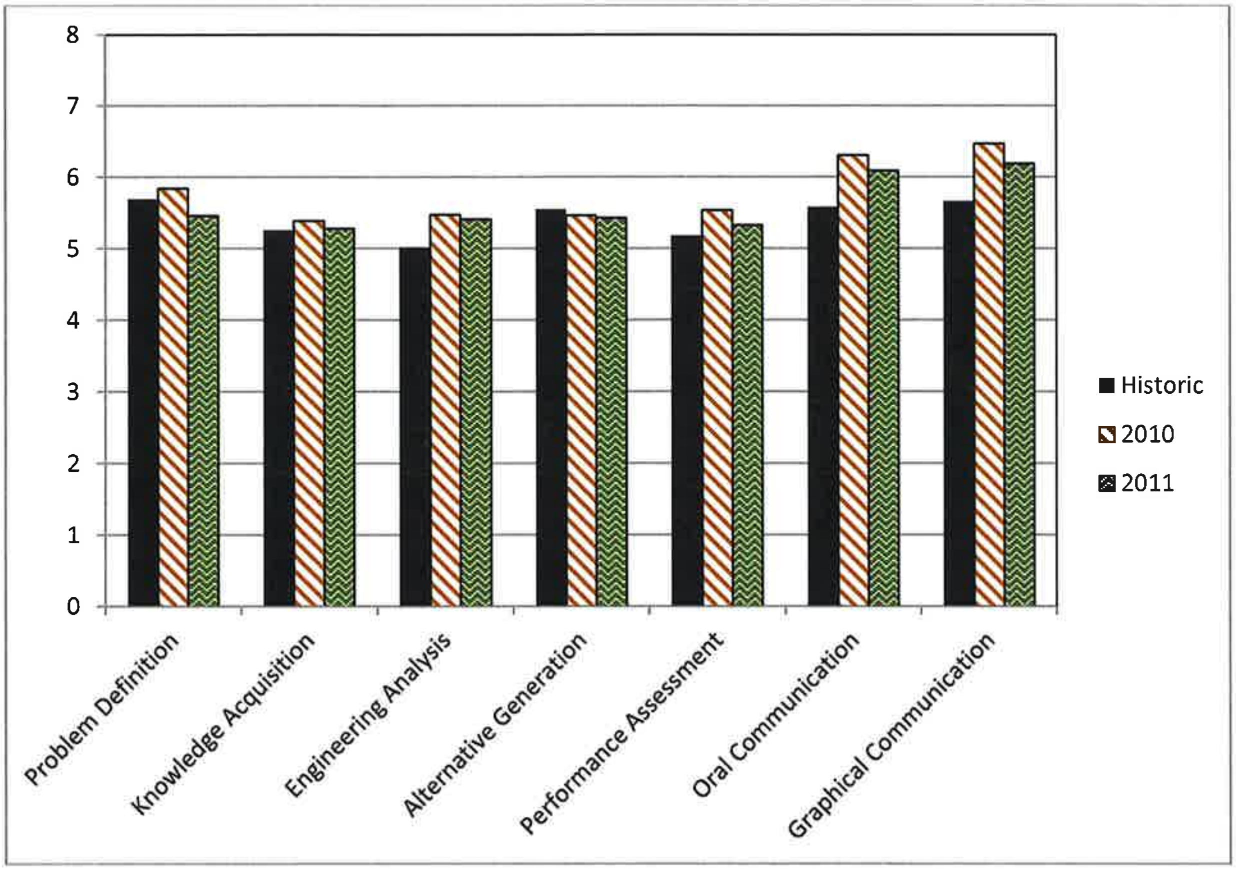

Figure 4. Assessment of capstone design projects by a panel of professionals

The data for learner outcomes is measured and assessed in every course by the faculty. However, a set of these are mapped to the program level. The mapped set is used for assessment of the program.

Graduate Program Assessment

For the graduate programs data collection and analysis are missing because this is the first year that the IME Department will 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 Table 7 below.

Table 7. Graduate Student Activities

	2009	2010	2011
Graduate Student Co-Authored Journal Publications	5	3	6
Graduate Student Co-Authored Conference Publications	12	15	14
GRASP Paper Presentations	N/A	4	3
IIE Poster Presentations	1	2	2

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 Industrial and Manufacturing Engineering courses. Please refer to Table 1 and Table 2 for the mapping of ABET criterion to courses.

Oral and written communication is measured through data collected in courses for ABET criterion g. "Ability to communicate".

Numerical literacy is measured through ABET criterion a. "ability to apply math and science" in the following courses – IME 550 – Operations Research, IEM 553 – Production Planning and Control, and IME590/690 – Senior Design.

Critical thinking and problem solving are measured through four criteria in ABET - the ability to design and conduct experiments (criterion b), the ability to design systems and components (criterion c), ability to solve engineering problems (criterion e) and the ability to develop, implement, and improve integrated systems (Criterion IE1 for BS in IE & Criterion ME4 for BS in EM)

Collaboration and team work are 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 is measured through ABET criterion g –"Ability to understand global and societal context. Diversity in discipline and culture are addressed by analyzing data from 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 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 Industrial Engineering program is accredited by ABET.

The following concern was expressed by ABET with reference to the BS in Industrial Engineering program.

Criterion 1 of ABET – Students

Concern: "This criterion states that – the institution must have and enforce procedures to assure that all students meet all program requirements. There is a difference in the curriculum published in the paper version of the 2007-2008 catalog and the on-line version. The negative impact on students is confusion about graduation requirements".

Response: This concern was immediately addressed and corrections were made.

The Bachelor of Science in Engineering for Manufacture program is accredited by ABET.

There were three concerns for the Engineering for Manufacture program.

ABET Concern 1 with respect to Criterion 1 of ABET – Students

"This criterion states that – the institution must have and enforce procedures to assure that all students meet all program requirements. There is a difference in the curriculum published in the paper version of the 2007-2008 catalog and in the on-line version. The negative impact on students is confusion about graduation requirements"

Response: This concern was immediately addressed and corrections were made.

ABET Concern 2 with respect to criterion 5 of ABET – Faculty

This criterion states "the faculty must be of sufficient number; and must have the competencies to cover all of the curricular areas of the program." A concern exists regarding the program having the proper mix of faculty competencies to support the manufacturing engineering courses. Due to a recent retirement, there is only one faculty member with competency in physical science based phenomena of manufacturing processes. This could stretch the faculty's ability to develop and offer additional courses, particularly as the manufacturing engineering minor that is offered to graduate students becomes populated, composite engineering activities increase, and enrollment increase.

Response: At the time of ABET visit, the department has shown that it planned to hire a faculty member of distinction in the area of composites. However, as it has been difficult to find a faculty of distinction after two failed searches for the "Bomhoff Professor" in composites, the money was moved to hire a faculty in the area of bioengineering. Thus the concern still remains about hiring additional faculty for manufacturing. The department is currently working with the Dean of the College of Engineering in getting approval for a new faculty position in manufacturing.

ABET Concern 3 with respect to institutional support and financial resources

This criterion states "institutional support, financial resources, and constructive leadership must be adequate to assure the quality and continuity of the engineering program". A concern exists regarding the low enrollment in manufacturing engineering. The program is starting a number of initiatives to increase enrollment that could be jeopardized if the institution discontinues adequate support to the program before results are realized.

This criterion also states that "support personnel and institutional services must be adequate to meet program needs." Only one, half-time laboratory technician is available to support the manufacturing engineering laboratories with back-up provided by graduate students. The technician has a full-time job during the day and supports IME laboratories in the evenings. The funding for this position was cut from a full-time position several years ago and the current funding is not on a permanent basis. While this level of support is sufficient for current class laboratory sections and some project work, laboratory support is greatly limited and could be in jeopardy if support is cut or the technician is otherwise unavailable. The laboratory development plan also calls for new equipment and equipment replacement over the next few years that will require training which could be difficult if the technician is only available in the evenings.

Response: The department has continued to fund the technician position at a half-time level until Spring 2012. The College of Engineering has hired a full-time technician who will be in charge of the manufacturing process labs. The technician will be supported by graduate students when classes are offered. To address the concern with regard to low enrollment, the college has hired a new person for the purposes of recruitment.

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 scores for both the BSIE (25.95) and BSEM (23.95) programs are better than the University average (22.65). The number of students in the MSIE program has remained steady at about 100. The MEM program and PhD program continues to grow.

The undergraduate programs in Industrial Engineering and Engineering for Manufacture are 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 compete regularly in the Institute of Industrial Engineers regional paper competition and are usually placed in the event. In 2012, the undergraduate students were placed in the 2nd and third position at the regional paper competition. The region includes universities such as Kansas State, Oklahoma State, Texas A&M, University of Oklahoma, University of Missouri, etc. All undergraduate students participate in at least one open house project presentation before they graduate.

For the graduate level courses, all course syllabuses were changed to include learner outcomes in Spring 2012. A plan for the assessment of the courses is being developed. Thus the majority of data that are available is for the two undergraduate programs. More data will be available for the graduate courses and the programs by the next reporting period. The available data on presentations and publications for the graduate program is provided in Table 7.

Overall, the programs offered by the Department of Industrial and Manufacturing Engineering have a sound curriculum as evidenced by the data collected under assessment for the BS in Industrial Engineering program and Engineering for Manufacture program. There is a good assessment system for the undergraduate program. Most of the students also have coop/internships in their junior/senior year. In fact, all of the domestic students who have a GPA of 3.0 or above have an internship with a local company before they graduate. Each semester there are about 10 students that have internship with local companies.

The MS in IE, Master's in Engineering Management, and PhD programs also have a sound curriculum. Although formal data assessment results are not available, the publication record in Table 7 shows that students are active in their research and academic activities. By the next reporting cycle, the department hopes to have more concrete evidence and data to show the robustness of the program.

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 - BSIE

Majors						Employment of Majors*						
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	No. pursuing graduate or profes-sional educa-tion	Projected growth from BLS**
Year 1→					11	**See Table 8 for a summary of national statistics**						Current year only
Year 2→					13							↓
Year 3→												

	Race/Ethnicity by Major***									Race/Ethnicity by Graduate***								
	NRA	H	AI/AN	A	B	NH/PI	C	MR	UNK	NRA	H	AI/AN	A	B	NH/PI	C	MR	UNK
Year 1→	12	1	0	1	2	0	24	0	1	3	1	0	0	1	0	6	0	0
Year 2→	13	2	0	1	2	0	27	0	1	5	0	0	0	1	0	7	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.

The median annual wage of industrial/manufacturing engineers was $76,100 in May 2010. The enrollment for the BS in Industrial Engineering program has remained steady at 70, 71, and 76 for fall 09, fall 10 and fall 11 respectively. Based on data from the Bureau of Labor and statistics, the number of jobs per industrial/manufacturing graduate is 3.5 (Table 8). The growth rate in jobs from 2010-2020 is expected to be 14%. The national average for engineering jobs is 6%. Thus, there is a strong demand for industrial and manufacturing engineers. The increased emphasis in manufacturing in the United States is expected to increase the demand further. The Wichita Metropolitan area has been identified as one of the clusters in the manufacturing industry (Please refer to the following link for the report: http://www.brookings.edu/research/reports/2012/05/09-locating-american-manufacturing-wial). The presence of a strong and vibrant Industrial Engineering and Engineering for Manufacture program is vital to the local economy of Wichita.

Graduates of the BS program in Industrial Engineering typically find jobs as industrial engineers, process engineers, quality control engineers, ergonomics engineers, production supervisors, etc. Most of the 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. Graduates that have left Kansas have found employment at General Motors, US Mint, Corning, Cummings Engines, etc.

Table 8. Data from the Bureau of Labor & Statistics

	Median Pay	Jobs in 2010	Change in 2010-2020	Degrees Awarded 2010	Jobs per graduate
IE/Manufacturing	$76,100	203,900	13,100	3,744	3.5
Mechanical Engineering	$78,160	243,200	21,300	18,391	1.16
Aerospace Engineering	$97,480	81,000	4,000	3,218	1.24
Electrical Engineering	$87,180	294,000	17,600	9634	1.83
Computer Engineering	$98,810	70,000	6,300	6,094	1.03
Bio-Engineering	$81,540	15,700	9,700	3,670	2.64

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.

Undergraduate – BSEM

Majors						Employment of Majors*						
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	No. pursuing graduate or profes-sional educa-tion	Projected growth from BLS**
Year 1→					3							Current year only ↓
Year 2→					2							
Year 3→												

	Race/Ethnicity by Major***									Race/Ethnicity by Graduate***								
	NRA	H	AI/AN	A	B	NH/PI	C	MR	UNK	NRA	H	AI/AN	A	B	NH/PI	C	MR	UNK
Year 1→	3	0	0	2	2	0	9	0	4	0	0	0	0	0	0	2	0	1
Year 2→	4	0	0	1	2	0	12	0	3	0	0	0	0	0	0	2	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.

The enrollment for the BS in Engineering for Manufacture program was 28, 30, and 21 for fall 09, fall 10 and fall 11 respectively. For the analysis of the need for the program, please refer to section 4a.

Graduates of the BS program in Engineering for Manufacture typically find jobs as manufacturing engineers, process engineers, quality control engineers, production supervisors, etc. Most of the 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. Graduates that have left Kansas have found employment in organizations that include General Motors and the US Army.

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).

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

Graduate - MSIE

Majors						Employment of Majors*						
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	No. pursuing graduate or profes-sional educa-tion	Projected growth from BLS**
Year 1→					30							Current year only ↓
Year 2→					28							
Year 3→												

	Race/Ethnicity by Major***									Race/Ethnicity by Graduate***								
	NRA	H	AI/AN	A	B	NH/PI	C	MR	UNK	NRA	H	AI/AN	A	B	NH/PI	C	MR	UNK
Year 1→	80	0	0	2	3	0	14	0	2	25	0	0	1	0	0	4	0	0
Year 2→	83	0	0	6	1	0	10	0	2	16	0	0	2	2	0	7	0	1
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.

The MSIE program has had enrollments of 100, 72, and 79 for fall 09, fall 10, and fall 11, respectfully. For the analysis of the need for the program, please refer to section 4a.

Graduates of the MS program in Industrial Engineering typically find jobs as industrial engineers, supply chain managers, lean manufacturing engineers, quality control managers, process improvement engineers, ergonomics specialist, production managers, etc. Most of the domestic students are already employed locally. They are employed in Wichita in companies such as Spirit Aero-systems, Hawker-Beechcraft, Cessna, Bombardier-Learjet, Case New-Holland, AGCO, Siemens, NetApp, etc. They are also employed nationally in companies such as Eaton, Cummings Engines, General Motors, and Ford Motor Company.

4d. 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 – MEM

Majors						Employment of Majors*						
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	No. pursuing graduate or profes-sional educa-tion	Projected growth from BLS**
Year 1→					3							Current year only ↓
Year 2→					4							
Year 3→												

	Race/Ethnicity by Major***									Race/Ethnicity by Graduate***								
	NRA	H	AI/AN	A	B	NH/PI	C	MR	UNK	NRA	H	AI/AN	A	B	NH/PI	C	MR	UNK
Year 1→	6	0	1	0	1	0	9	0	3	1	0	0	1	0	0	0	0	1
Year 2→	6	1	1	1	4	0	6	0	0	1	0	0	0	0	0	2	0	1
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.

The enrollment was 20, 13, and 21, for fall 09, fall 10, and fall 11, respectively. For the analysis of the need for the program, please refer to section 4a.

Graduates of the Master's program in Engineering Management typically have jobs locally. They are employed as industrial engineers, process engineers, quality control engineers, ergonomics engineers, production managers, etc. They are employed in Wichita in companies such as Spirit Aero-systems, Hawker-Beechcraft, Cessna, Bombardier-Learjet, Case New-Holland, AGCO, Siemens, NetApps, etc. They are also employed nationally in companies such as Eaton, Siemens, and Cummings Engines.

4e. 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*						
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	No. pursuing graduate or profes-sional educa-tion	Projected growth from BLS**
Year 1→					4							Current year only ↓
Year 2→					1							
Year 3→												

	Race/Ethnicity by Major***									Race/Ethnicity by Graduate***								
	NRA	H	AI/AN	A	B	NH/PI	C	MR	UNK	NRA	H	AI/AN	A	B	NH/PI	C	MR	UNK
Year 1→	6	0	0	3	1	0	3	0	0	2	0	0	0	0	0	2	0	0
Year 2→	12	0	0	3	1	0	2	0	2	1	0	0	0	0	0	0	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.

The enrollment was 23, 22, and 26 for fall 09, fall 10 and fall 11, respectively. The demand for the profession and its relevance to Wichita has been detailed in section 4a.

Graduates of the PhD program in Industrial Engineering find jobs as faculty, postdocs, supply chain managers, lean manufacturing engineers, quality control managers, process improvement engineers, ergonomics specialist, production managers, etc. They are employed in companies such as Eaton Corporation, Spirit Aero-systems, Hawker-Beechcraft, Cessna, Bombardier-Learjet, etc. Graduates are currently employed as faculty at Montana State University, Western Michigan, University of Arkansas, California State University-Pomona, Ohio University, Colorado State University, and others in the US and internationally..

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	20.4	21.7	
Gr Majors	38.9	30.2	
Non-Majors	40.8	48.1	

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 department's cost per CH is $273 per CH for 2009 and $260 per CH for 2010. The department offers service courses to the college through the following courses: IME 254 – Probability and Statistics, IME 255 – Engineering Economy, and IME 222 – Engineering Graphics. In addition, several of the departments' courses are also taken by students from mechanical engineering and electrical engineering (IME 254 Engineering Probability and Statistics I, IME 255 Engineering Economics, IME 258 Manufacturing Process and Materials I, IME 524 Probability and Statistics II, IME 554 Statistical Quality Control, and IME 664 Engineering Management). The calculations are based on the budget data provided in the university budget for the IME department.

In the past two years, the department has collaborated with the college in terms of the faculty composition. The department has added two faculty in the area of Bio-Engineering. These faculty are planning to offer courses that are of interest to both Bioengineering and Industrial Engineering students.

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 faculty is very productive in terms of research, publication, funding, and service.
2. Much of the research performed by the faculty is multi-disciplinary in nature.
3. Most undergraduate students gain coop/internship experience.
4. The faculty is diverse with respect to research and teaching.
5. Students have ready access to faculty.
6. There are five very active student professional organizations supported by the department.
7. The department has a relatively large graduate program.
8. There is a positive collegial atmosphere in the department.
9. Every undergraduate student has experience with two industry-based capstone design projects.

Weakness:

1. Not enough financial support for PhD students for long term planning and recruitment.
2. There is a significant shortage of both teaching and research laboratory space.
3. 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.

Opportunities:

1. Currently, the department has the lowest number of UG students in the college and has the capacity to handle more students.
2. Additional funding for undergraduate engineering education though Kansas Senate Bill #127.
3. As manufacturing becomes more sophisticated in local industry, the demand for industrial and manufacturing engineering graduates may increase.
4. Both manufacturing and service organizations are implementing continuous improvement strategies which may make use of faculty research capabilities.

Threats:

1. The growth of the department's programs may be limited by a lack of teaching and research laboratory space.

2. A continued deterioration in the local economy can have a negative impact because of the department's close relationships with local organizations.

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

1. The department plans to move to a culture of continuous assessment and improvement
2. The plans and measures for continuous assessment will be developed and implemented
3. The department plans to increase the experiential learning component in courses
4. New hybrid models of course delivery that take advantage of online teaching will be developed
5. Lab and problem based learning will be a significant component of the pedagogical approach employed by the department
6. The department plans to increase the percentage of courses taught by regular faculty
7. The department plans to increase the undergraduate student enrollment
8. The department plans to increase/investigate inter-disciplinary academic programs and research ideas
9. Develop a plan for further increasing research funding for the department
10. The department will implement a training scheme/support for adjuncts and GTAs

College: Engineering

Department/Program (s): Industrial and Manufacturing Engineering

Degree (s) Offered: BS, MS, and PhD in Industrial Engineering
BS in Engineering for Manufacture
MEM in Engineering Management

Triggers: Degrees – MEM; Majors and Degrees – Engineering for Manufacture

Brief Description of each degree:
The Bachelor of Science in Industrial Engineering (BSIE) focuses on the design, analysis, improvement, and management of systems in manufacturing and service organizations. Industrial engineers bridge the gap between management and operations while emphasizing process improvement.
The Bachelor of Science in Engineering for Manufacture (BSEM) equips graduates with engineering methods, skills and experience required to develop and improve manufacturing processes and systems.

The Master of Science in Industrial Engineering (MSIE) degree program prepares students for research and design in the areas of Systems Engineering, Manufacturing Engineering, and Ergonomics. Students can complete the degree through three options: thesis, directed project, or all coursework.
The Master's in Engineering Management (MEM) degree program is directed towards helping engineers develop planning, decision making, complex problem solving and managerial skills while receiving advanced technical knowledge."

The Doctor of Philosophy in Industrial Engineering (PhD IE) degree program is directed towards training students to perform research and advance knowledge in the areas of Systems Engineering, Manufacturing Engineering and Ergonomics.

Assessment of the Quality of the Faculty:
In 2011, the faculty in the IE Department (including two who are in bioengineering) published 15 refereed journal articles, together with making numerous presentations at academic conferences and accomplishing other scholarly related activities. There are plans to hire one more faculty member to support the Engineering for Manufacture area. This appears intuitive since this area currently has but one faculty member. The volume of funded research generated by the faculty continues to increase each year (see section on Outside Funding and Support). The departmental document also reflects the role that IE faculty play in various aspects of the University as well as in their discipline based organizations. The section on faculty quality is very well written, and reflects well on the Department's accomplishments.

Assessment of the Quality of the Undergraduate Students: Undergraduate students in both the IE program and the Engineering Manufacture program have higher average ACT scores than the University as a whole. Graduate GPAs of admitted students seem in line (overall) with the College and University, except for the MEM program.

Assessment of Learning Outcomes:
There is a **very detailed** outline of the assessment approaches utilized within the Department. The learning outcomes for the department's bachelor's degrees are in concert with ABET expectations. These programs are accredited by ABET through 2013. In the Departmental document, as well as in the Dean's comments, it was noted that assessment activities for the BSIE are accomplished primarily through classroom assessment tools. The outcomes appear to (primarily) be a summation of course grades, which is an indirect measure of student learning. A few direct measures are reported. Actual numbers of students evaluated is not reported

As the assessment plans for graduate level classes have only recently been put in place, there are no results to be evaluated.

The feedback loop regarding how results of assessment are used is clearly in place and being utilized. Although only three of the five ABET Learning Outcomes are currently being achieved, the Department appears to be moving aggressively to remedy the shortcomings in the two deficient areas. Scores on student satisfaction surveys are collected. They reflect overall satisfaction with the undergraduate educational experience. Minimal documentation of examples of how the data are used to make improvements is provided.

Placement of Graduates:
Some general information is provided about the placement of IE and EM graduates from WSU programs. The information provided is lacking in specificity, but reflects the strong demand for graduates of this program. Most of what is reported relates to aggregate trends from across the country.

Outside Funding and Support:
Faculty in the Department have generated grant support of $.8, $1.1 and $1.3 million dollars over the past three years respectively.

Summary and Recommendations:

Commendation:

- Overall, this is a well written and documented review. It reflects pride and care in preparation, and displays the Department in a positive "light."

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

- Document program changes that occurred through assessment of student learner outcomes and other data collected.
- The learning outcomes for all programs 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 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.
- Update on plans for increasing majors in the master programs.
- Address concerns of the Graduate School in terms of the assessment process for the graduate programs.
- Assure that the last two gaps in the accomplishment of the ABET learning outcomes are closed as soon as possible.
- Develop a plan for the assimilation of the Bio Engineering Faculty into a permanent department.

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.