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)

[redacted]

Degree MS Industrial Engineering CIP code: 14:35

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).**

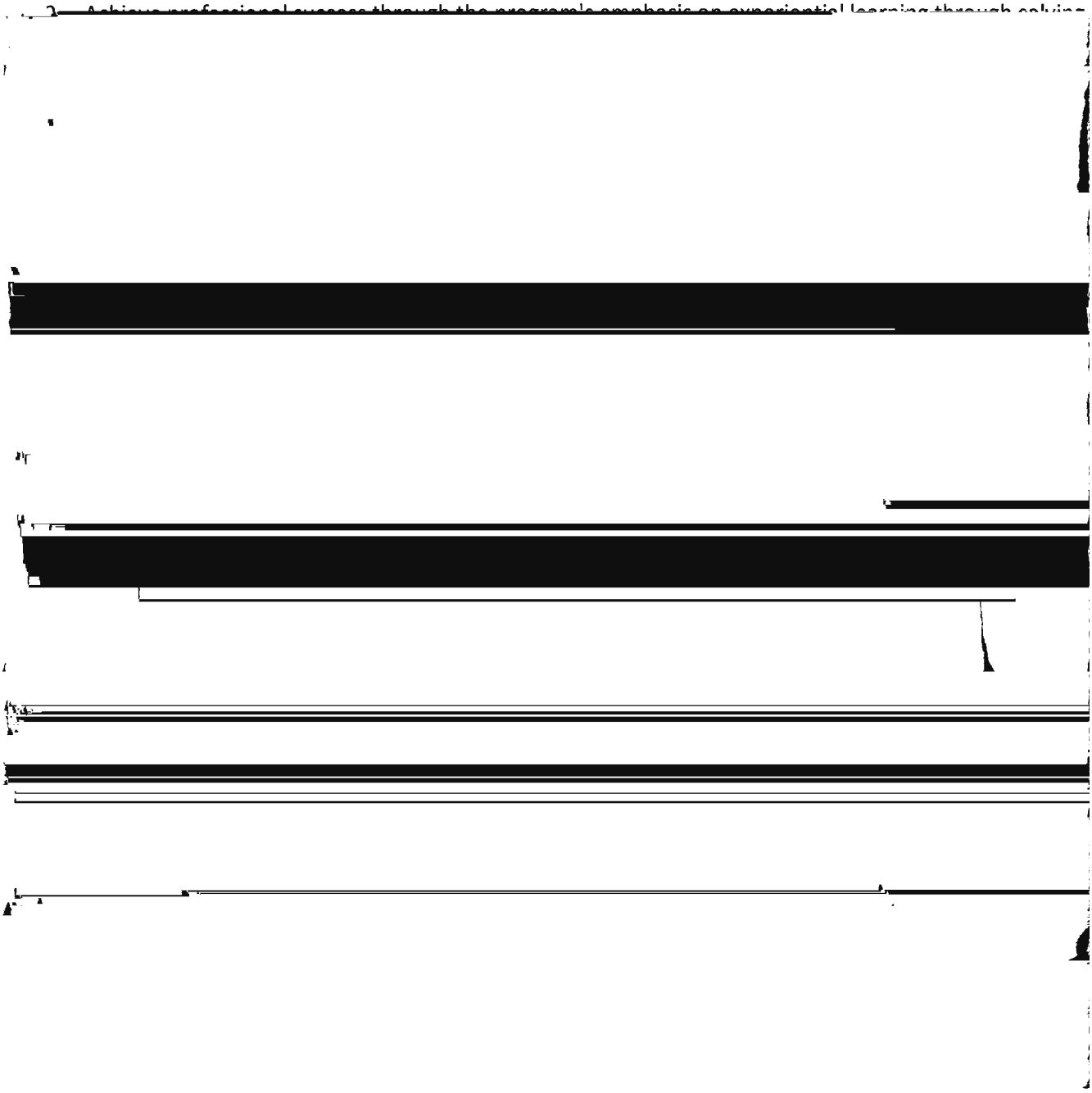
a. University Mission:

Wichita State University is committed to providing comprehensive educational opportunities in an urban [redacted]

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



real world problems.

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

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

[redacted]

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

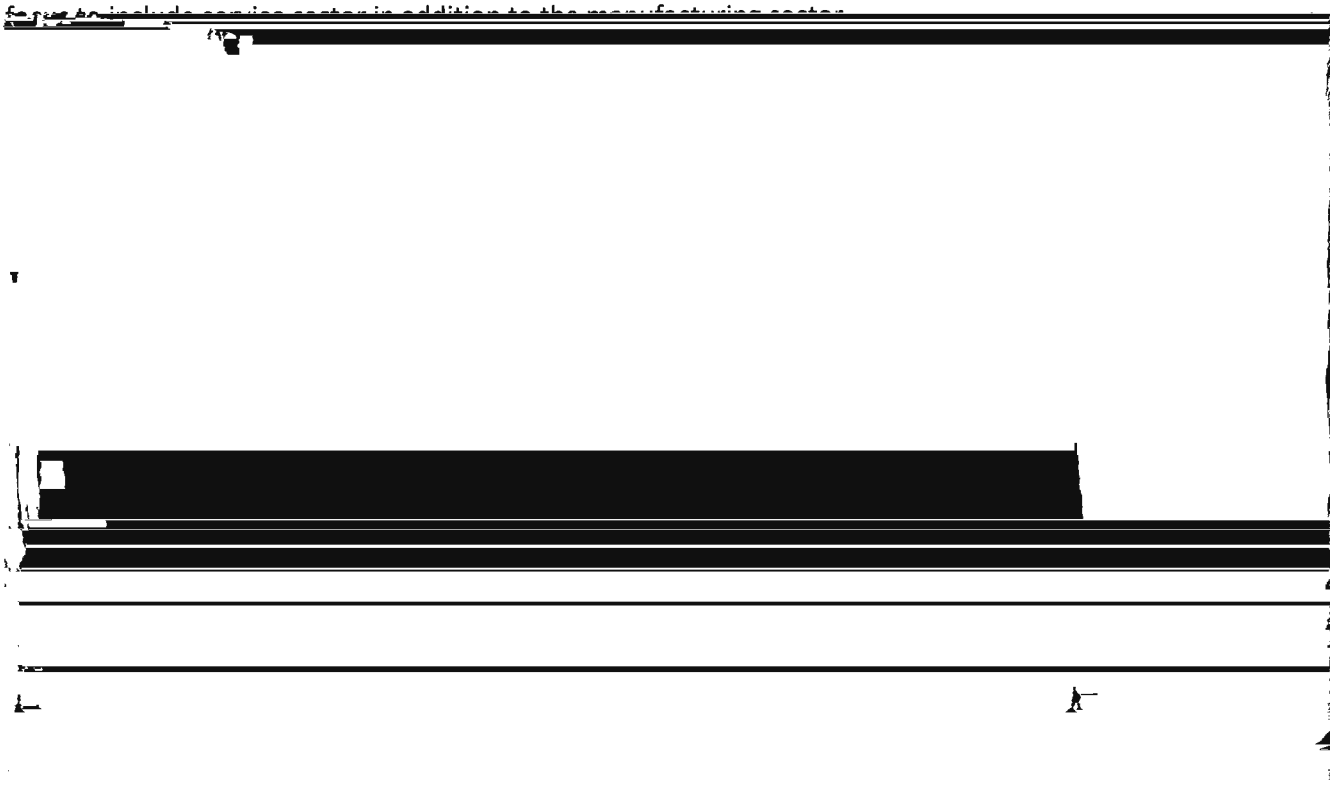
i. If yes, describe in 1-2 concise paragraphs. If no, is there a need to change?

[redacted]

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.

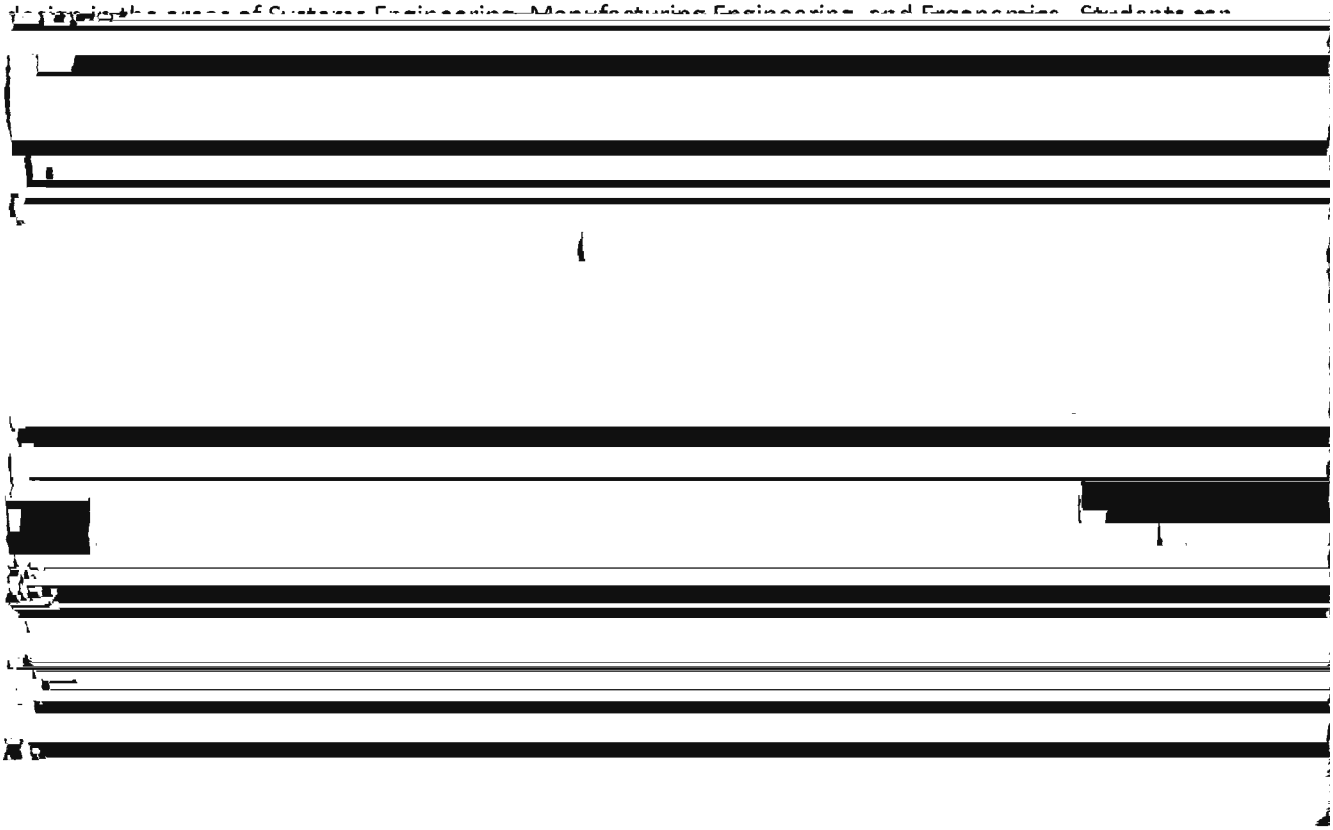
[redacted]

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 [redacted] the areas of Systems Engineering, Manufacturing Engineering, and Ergonomics. Students can



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

[redacted]

8	8	8 7	0	2 5	4326	41	11
8	8	7.0	0	2.6	4530	46	13

[redacted]

11.2	386	--
9.6	472	

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	Tenure/Tenure	Instructional FTE (#):	Total	Total	Total
5	8	18		9	$762,417	
3	11	30		10	$1,134,537	
15	16	28		20	$1,284,364	

[redacted]

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

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→				
Year 2→				
Year 3→				

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 2 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

3a. Describe the quality of the program as proposed by the strengths, productivity, and qualifications of

*	*	*	*	*	N/A	101	30
*	*	*	*	*	N/A	102	28
*	*	*	*	*			

N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A

the faculty in terms of SCH, majors, graduates and scholarly productivity (refer to instructions in the

2d. Describe the quality of the program as assessed by the strengths, productivity, and qualifications of

*	*	*	*	*	N/A	20	3
*	*	*	*	*	N/A	19	4
*	*	*	*	*			
					N/A	N/A	N/A	N/A
					N/A	N/A	N/A	N/A
					N/A	N/A	N/A	N/A

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.

* 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=2 additional KBOR data minima for doctoral programs: Graduates=3; Faculty=2 additional

Masters in Engineering Management

Last 3 Years	Tenure/Tenure	Tenure/Tenure	Instructional FTE (#).	Total	Total	Total

[redacted]

N/A

20 1

[redacted]

41	20		26.1		23.5		22.66		
46	22		25.6		24.4		22.72		
							22.81		
93	28	18	3.34	2.99	3.68	3.33	3.51	3.48	3.62
100	36	35	3.34	3.30	3.57	3.36	3.57	3.48	3.62
65	25	17	3.23	3.25	3.50	3.40	3.60	3.48	3.67

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)		
	IF	FM	IF	FM	All University Students FT

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 IE	DM	MJ	BY	LW	GW	JT	KK	JT	VM	DM Sr	
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

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

Quiz #1			15			
Exam #1 (2 Questions)			26	30		
Project #1	37		37	50		
Project #2	32	50				
Exam #2 (1 Question)	12	15				
Quiz #4	16	20				
Term Project	78					
Exam #3 (3 Questions)	24	30				
All Individual Assessments					532	650
Column Total	199	265	90			
Program Outcome	75.1		78.2		81.2	

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
				20		
		50				
			12	15		
		100				
				115		

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.

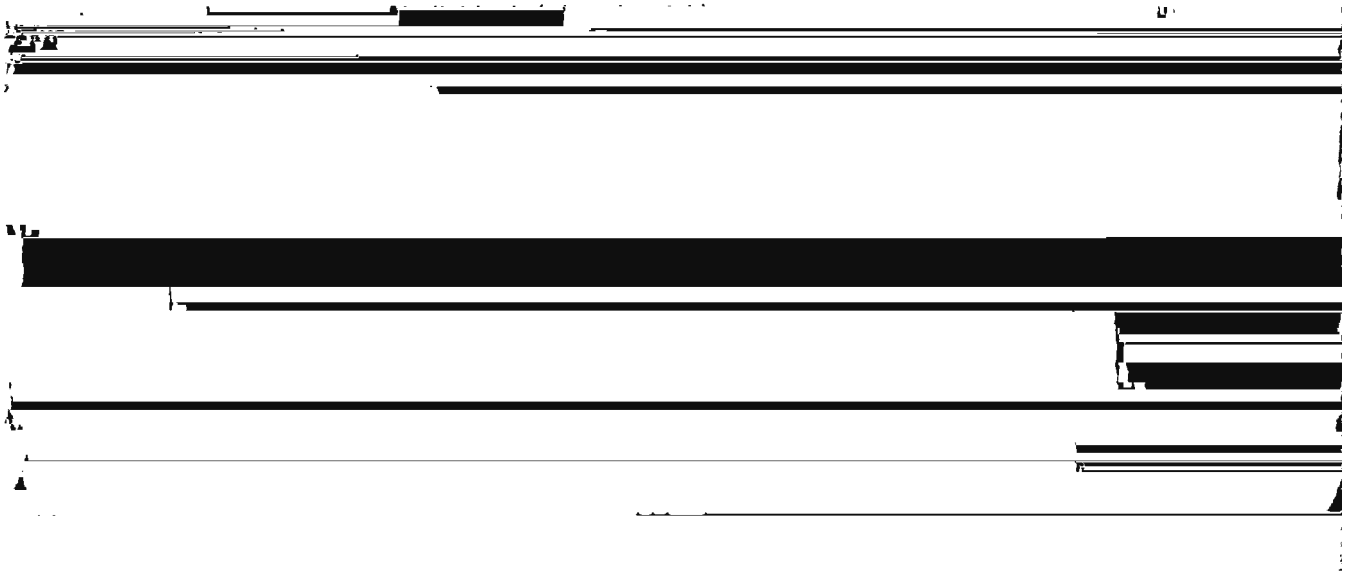
Based upon the ABET accreditation process, the learning outcomes are assessed by measuring and ensuring that each undergraduate student in the BS in Engineering for Manufacture Industrial Engineering program has:

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,

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)

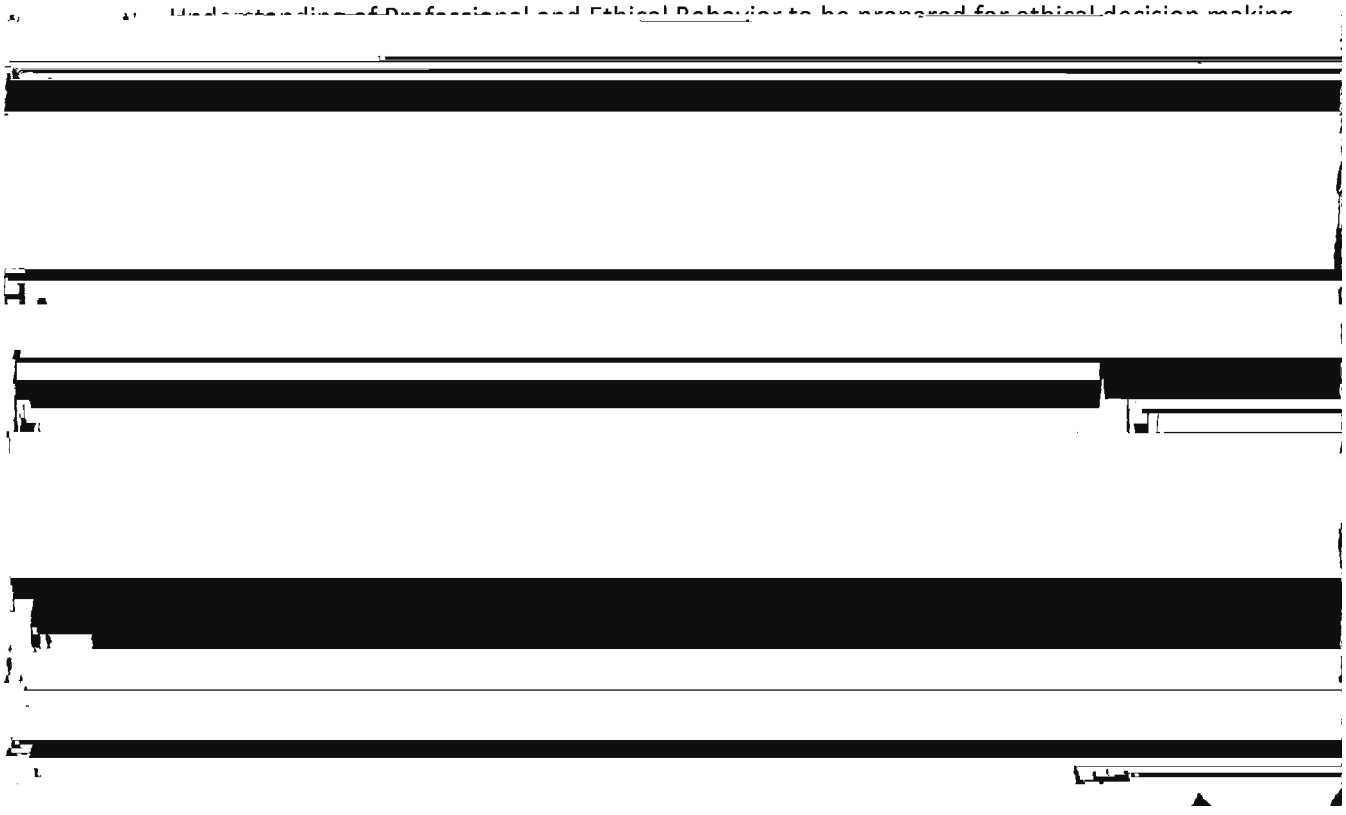
ii. Professional Skills to communicate in both oral and written forms and to be proficient in working



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



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

Feedback Loop:

[redacted]

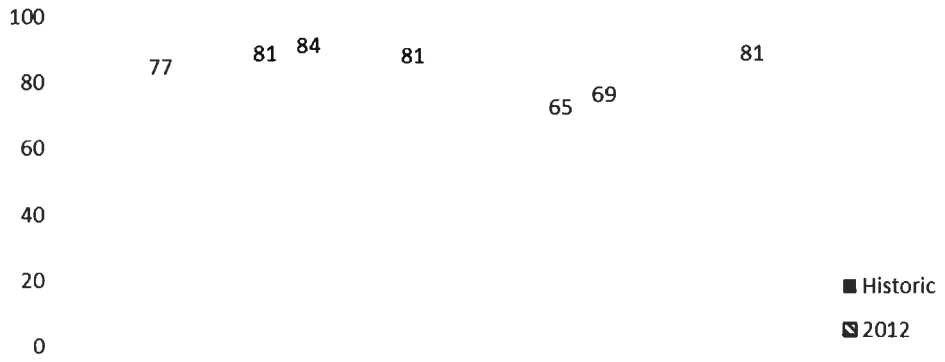


Figure 1 Comparison of program assessment learning outcomes for the 2012 academic year.

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

[redacted]

Graduate Programs

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

[redacted]

systems, components, or [redacted]	which emphasize design and [redacted].		

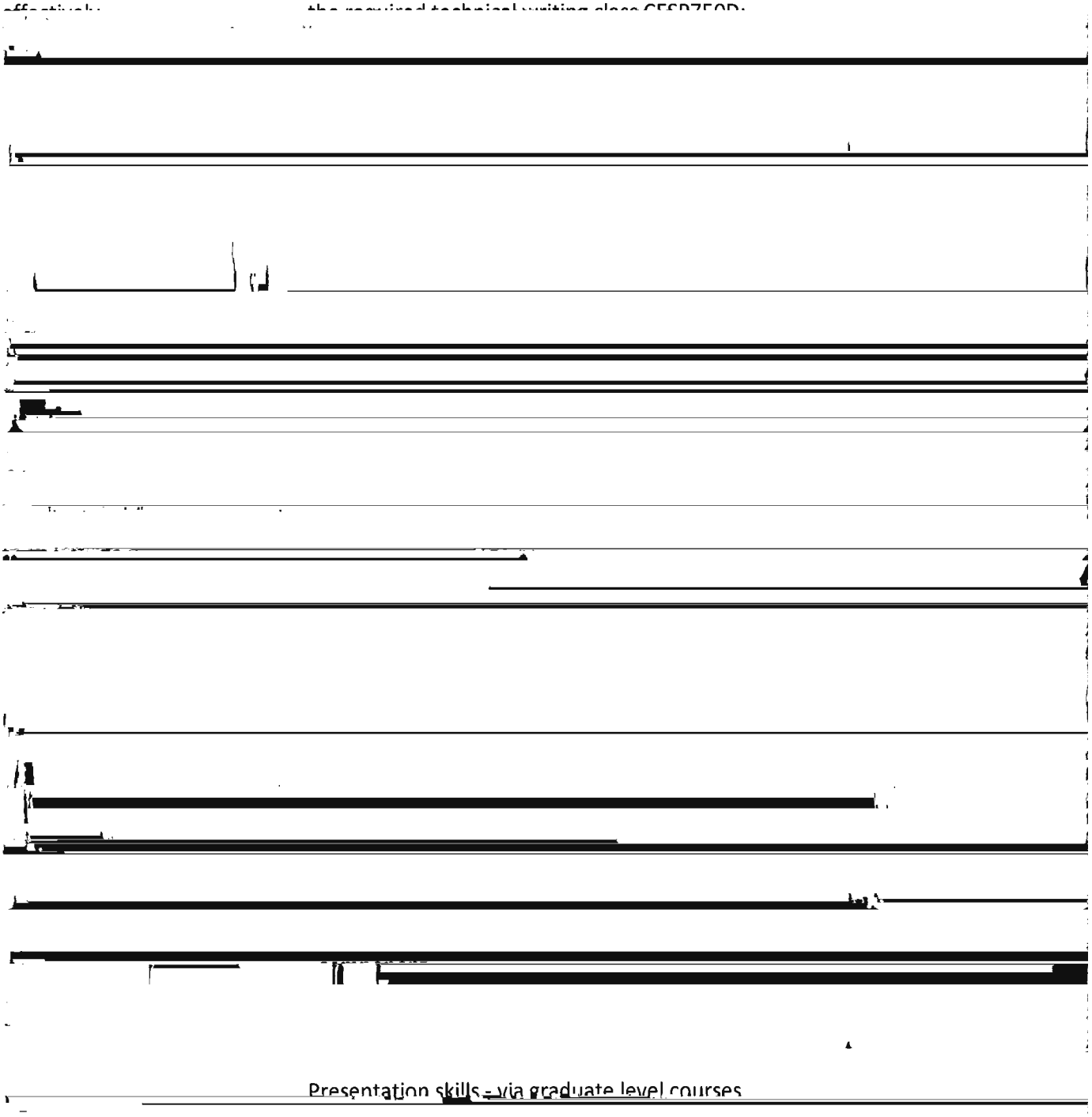
[redacted]

needs

Graduates will have a [redacted]	Graduate students will be assessed using Collaborative Institutional Training Initiative CITI integrity modules supported through the Office of Research Administration	80%	N/A
and ethical responsibility			

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

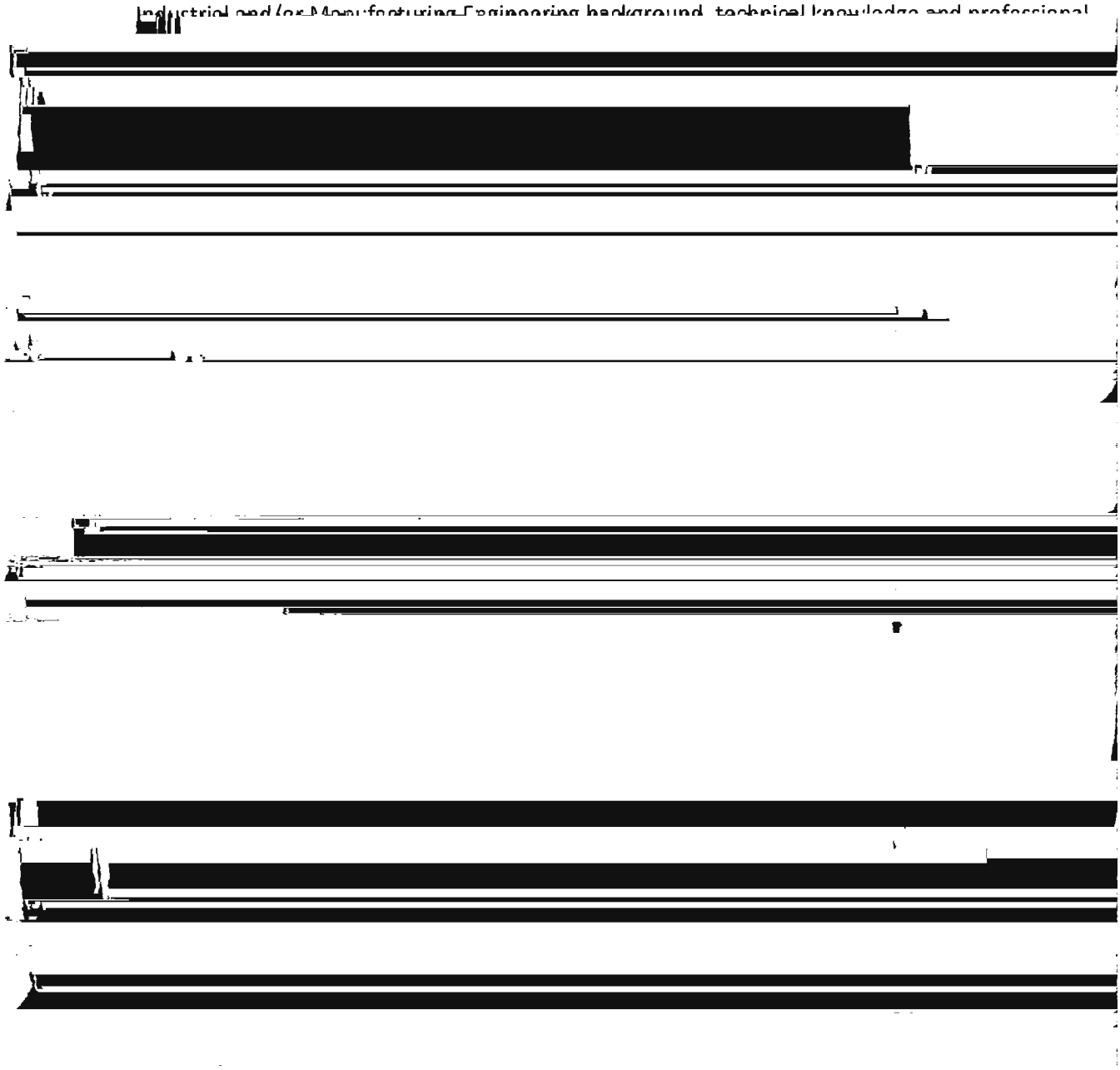
Graduates will communicate effectively	writing skills - via assignments and projects in the required technical writing class CESD750D;	80%	N/A



Presentation skills - via graduate level courses

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

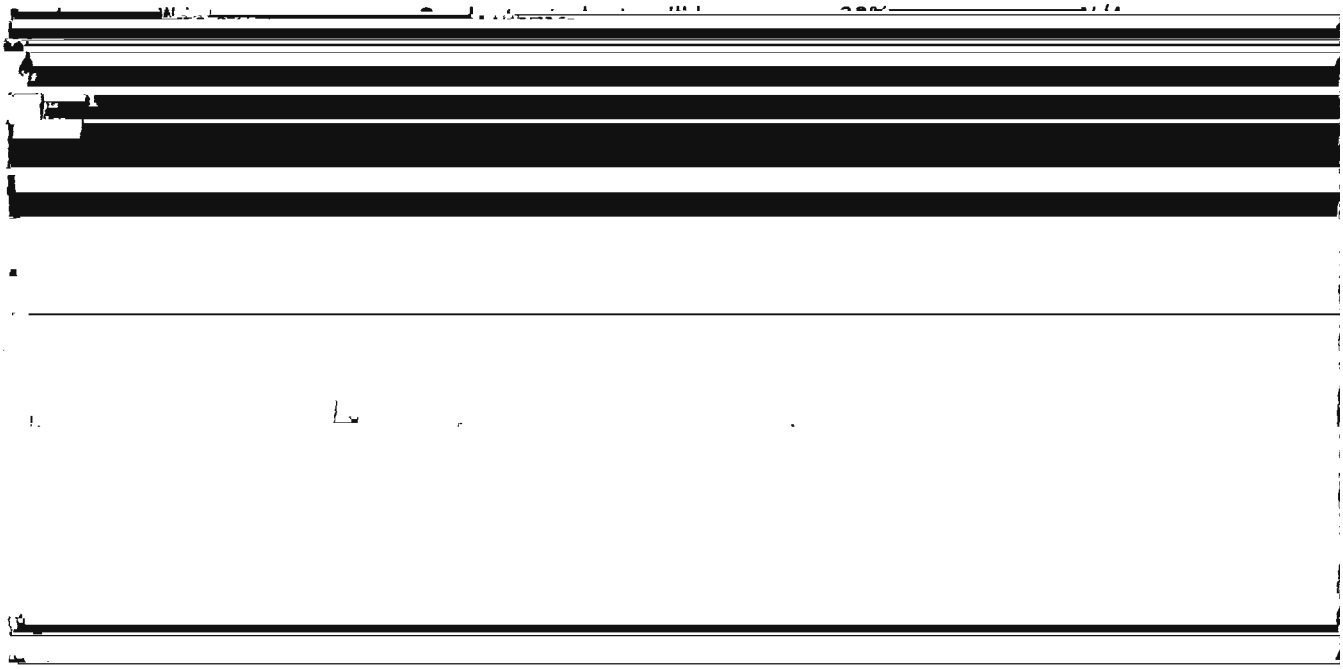


2. the knowledge, professional skills, and good publication record in their research area to get employment in academic positions
3. the ability to communicate effectively via technical papers and presentations

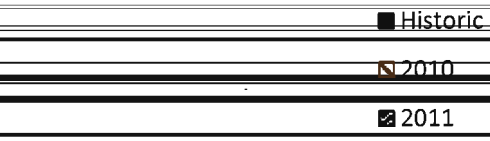
The PhD in Industrial Engineering program goals will be assessed on an annual basis using the following measures:

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. [redacted]

	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



[redacted]



[redacted]

Self-evaluation of Student's Knowledge and Ability

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

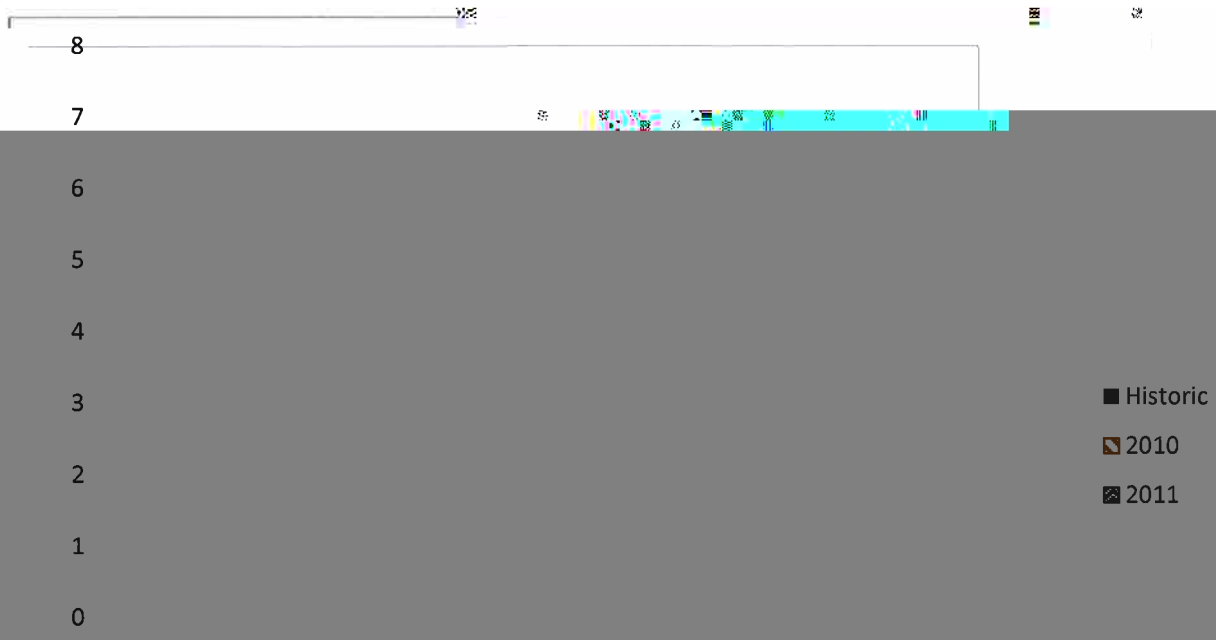


Figure 4. Assessment of capstone design projects by a panel of professionals

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

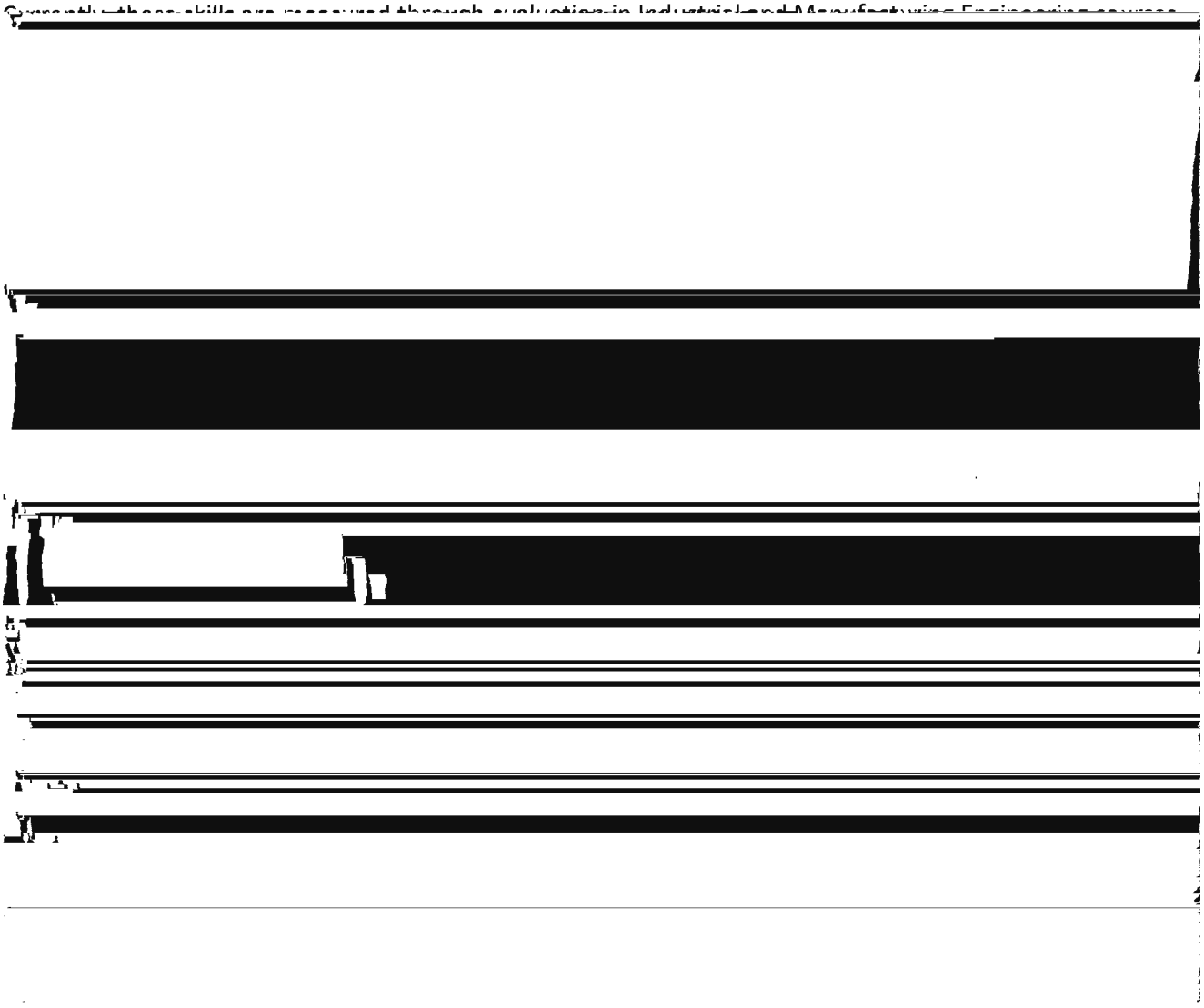
For the graduate programs data collection and analysis are missing because this is the first year that the IME

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/



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".

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.

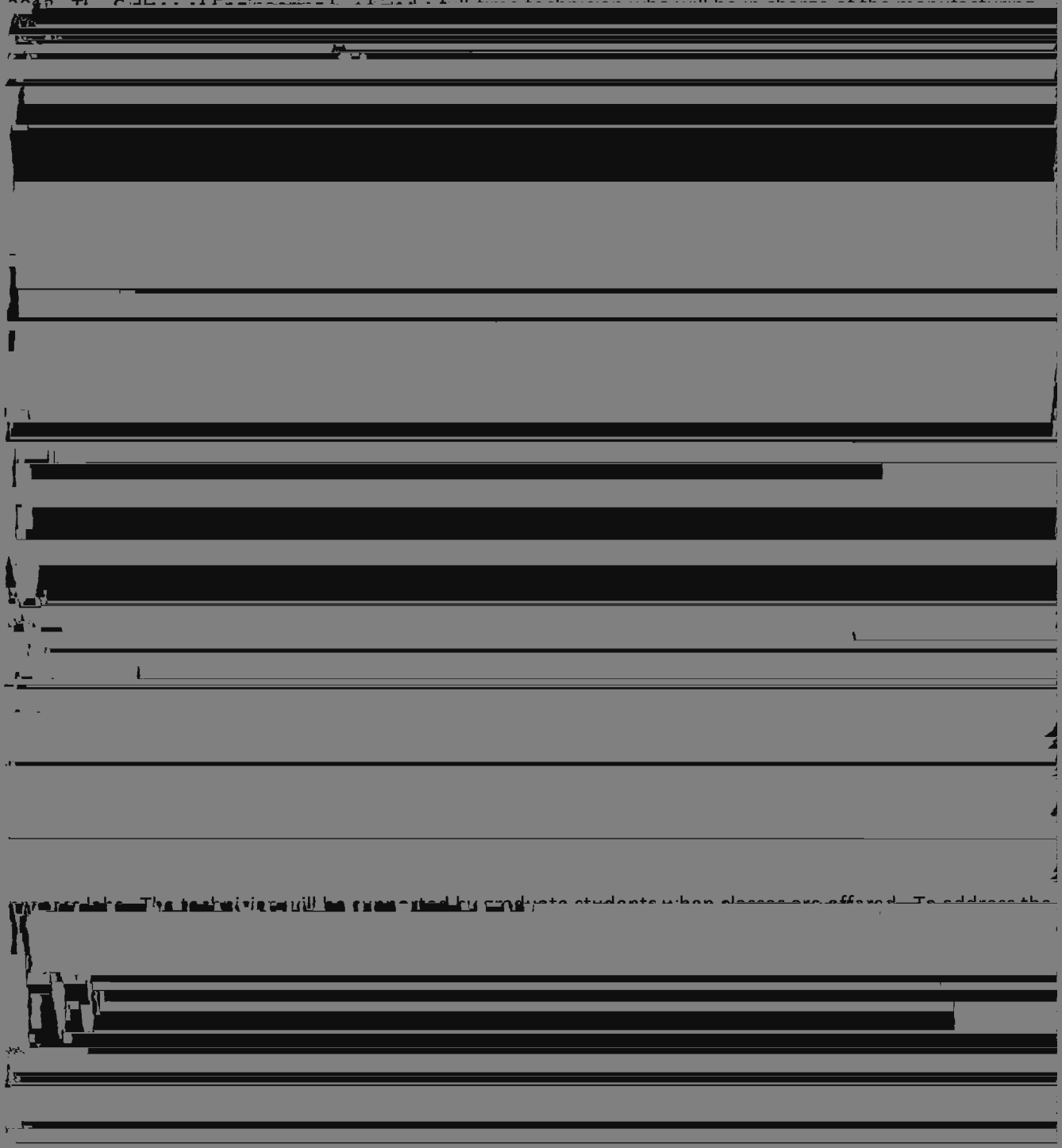
Criterion 1 of ABET – Students

[redacted]

[redacted]

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



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.

[redacted]

11

13

12 1 0 1 2 0 24 0 1 3 1 0 0 1 0 6 0 0

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

13 2 0 1 2 0 27 0 1 5 0 0 0 1 0 7 0 0

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

* May not be collected every year

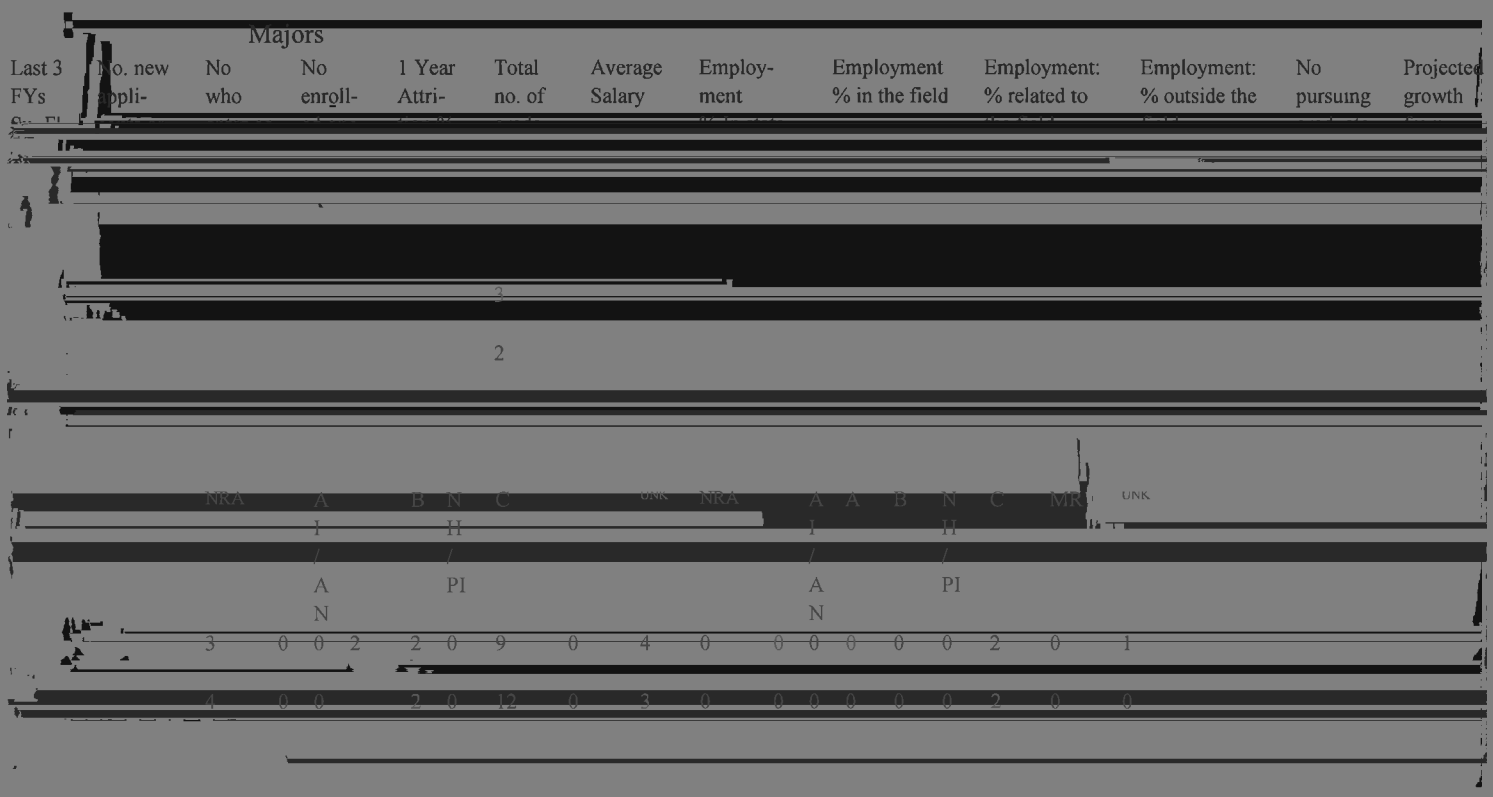
** Go to the U.S. Bureau of Labor Statistics Website: http://www.bls.gov/oco/ and view job outlook data and salary information (if the Program has

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

4b. Analyze the student need and employer demand for the program. Complete for each program if appropriate.



Majors

Last 3 FYs	No. new	No	No	1 Year	Total	Average	Employ-	Employment	Employment:	Employment:	No	Projected
	[illegible]	who	enroll-	Attri-	no. of	Salary	ment	% in the field	% related to	% outside the	pursuing	growth
					3							
					2							

	NRA	A I / A N	B	N H / PI	C	UNK	NRA	A I / A N	A	B	N H / PI	C	MR	UNK
	3	0	0	2	2	0	9	0	4	0	0	0	0	0	0	2	0	1
	4	0	0		2	0	12	0	3	0	0	0	0	0	2	0	0	

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

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

Undergraduate – BSEM

Employment of Majors*

↓

4c. Analyze the student need and employer demand for the program. Complete for each program if appropriate

Last 3 FYs –	No. new appli-	No. who	No. enroll-	1 Year Attri-	Total no. of	Average Salary	Employ- ment	Employment % in the field	Employment: % related to	Employment: % outside the	No. pursuing	Projected growth
					30							
					28							
										UNK		
				3		2						
			6									

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

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

Graduate – MSIE

(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 applicants or declared majors	No. who enter or are admitted in the major	No. enrolled one year later	1 Year Attrition %	Total no. of grads	Average Salary	Employment % In state	Employment % in the field	Employment: % related to the field	Employment: % outside the field	No. pursuing graduate or professional education	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	A	A	B	N	C	MR	UNK	NRA	H	A	A	B	N	C	MR	UNK
			I / A			H / PI						I / A			H / PI			
	6	0	N 0		1	0	9	0	3	1	0	N	1	0	0	0	0	1
Year 1→	6	1	1	1	4	0	6	0	0		0	0	0	0	0	2	0	1
Year 2→																		
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

[redacted]

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-

[redacted]

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 [redacted]

Last 3 FYs – Su, Fl, and Sp	No new applicants or declared majors	No. who enter or are admitted in the major	No. enrolled one year later	1 Year Attrition %	Total no. of grads	Average Salary	Employment % In state	Employment % in the field	Employment: % related to the field	Employment: % outside the field	No. pursuing graduate or professional education	Projected growth from BLS**
Year 1→	[redacted]				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→	[redacted]																	

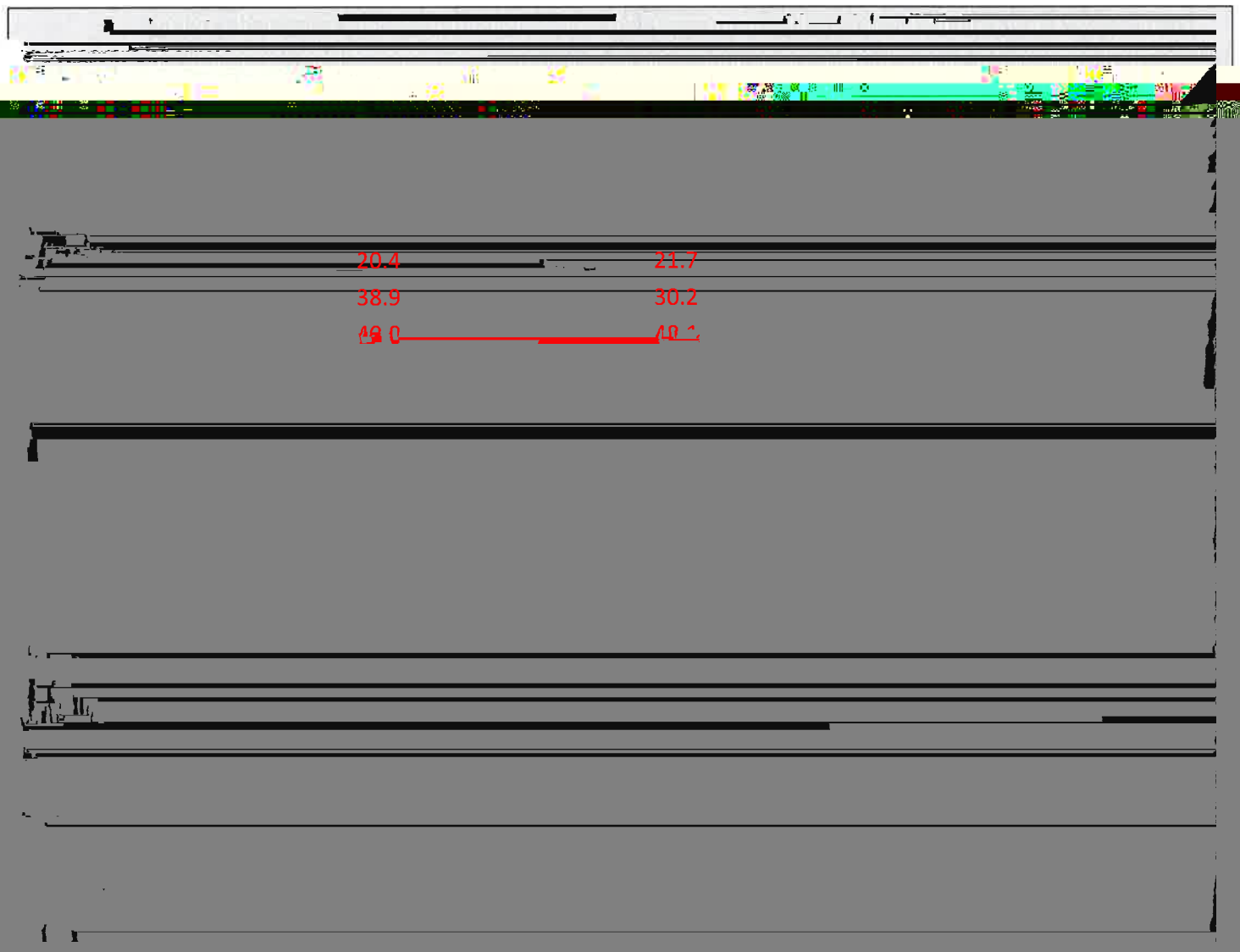
* May not be collected every year

** 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 [redacted]

program.

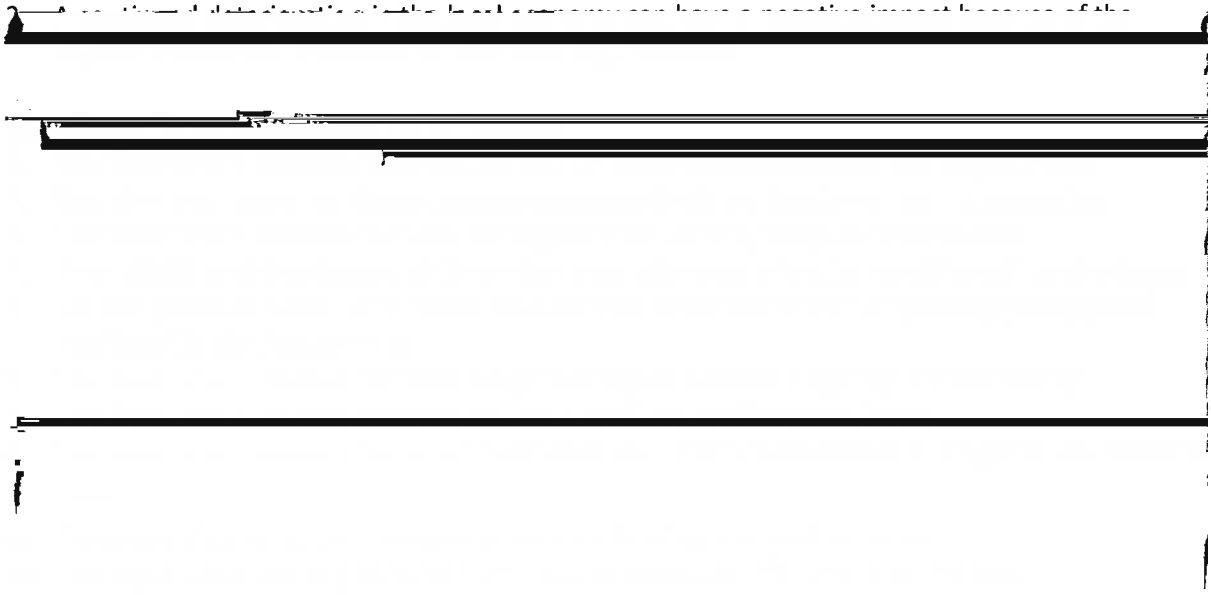
Graduate – PhD

Majors	Employment of Majors*


20.4
21.7
38.9
30.2

6. Report on the Program's goal (s) from the last review. List the goal (s), data that may have been collected to

(For Last 3 FYs) Assessment Data Analyzed



College: Engineering

[redacted]

MEM in Engineering Management

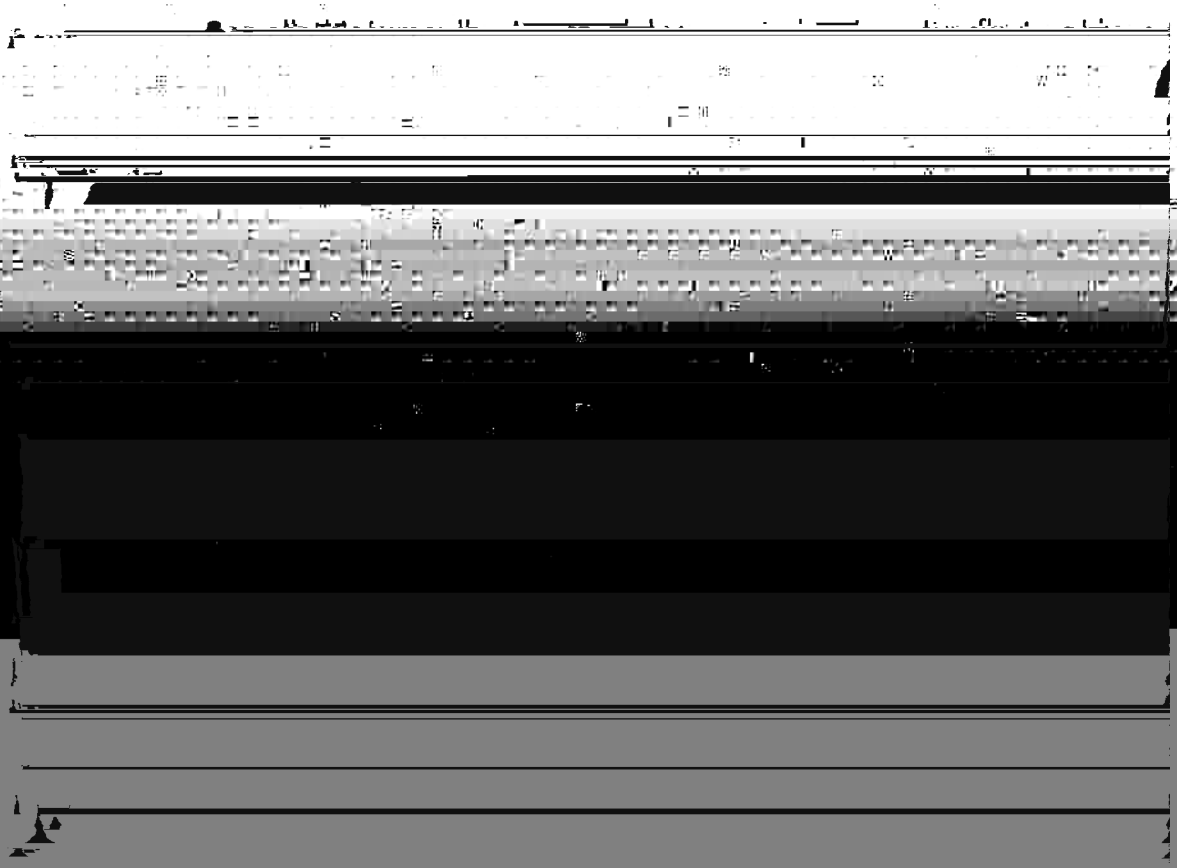
[redacted]

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 [redacted]

[redacted]

Summary and ons

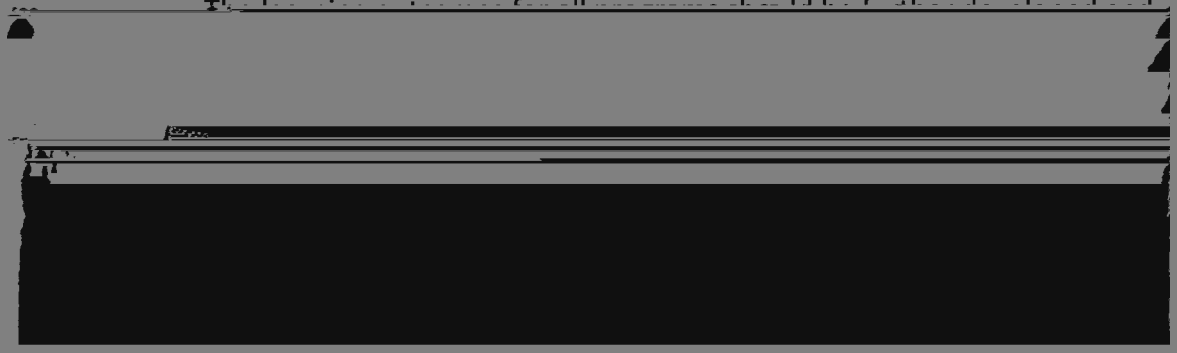
Commendation:



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.



Prior to the next review in 2015: