

## Biaglow, Andrew Dr

---

**From:** Nagelli, Enoch Dr  
**Sent:** Monday, May 12, 2025 1:16 PM  
**To:** Lucy Hair; K W; Michael Theising; Paul Dietrich; Kevin Shipe; Krishnamoorthy, Gautham; Armstrong, Matthew J. (Contractor); Matthew Armstrong; Liberatore, Matthew; Hill, Aaron T COL; Lucy Hair; Lucy; Kelly Schultz; Michael DeForest; Susan Daniel; Anne Kim Eller  
**Cc:** Biaglow, Andrew Dr; Cowart, Samuel V LTC; Costain, Kristen Mrs; Rittger, Walter Mr  
**Subject:** Postponement of 2025 Advisory Board Meeting & Assessment Packet and Survey for Feedback (Requesting Survey by May 30)  
**Attachments:** Advisory Board Slides - Section 2 - 10 April 2025.pdf; AY24 Program Assessment Data - 10 April 2025.pdf; AY25 Advisory Board Survey - Fillable.pdf; Advisory Board Memo 12MAY2025 final.pdf

Dear Esteemed Board Members of the USMA West Point Chemical Engineering Program,

Thank you for your patience and flexibility on the change in meeting dates for our originally planned Advisory Board Meeting. With the current DOD budget constraints and since the summer is understandably very busy for all Board Members and cadets, we are forgoing our in-person Advisory Board Meeting this year and instead sending you the following documents for your review and feedback:

- Memorandum of Record for the Postponement of Advisory Board Meeting and Request for Survey Feedback
- Review of the AY24 Program Assessment Data
- Review of the Advisory Board Slide Deck
- AY25 Advisory Board Survey (Fillable)

**We would appreciate it if you would complete the attached AY25 Advisory Board Survey after reviewing the documents and return it to Dr. Nagelli (enoch.nagelli@westpoint.edu) by 30 MAY so we can complete our program assessment.** Your survey feedback is critical in the yearly assessment cycle for our program.

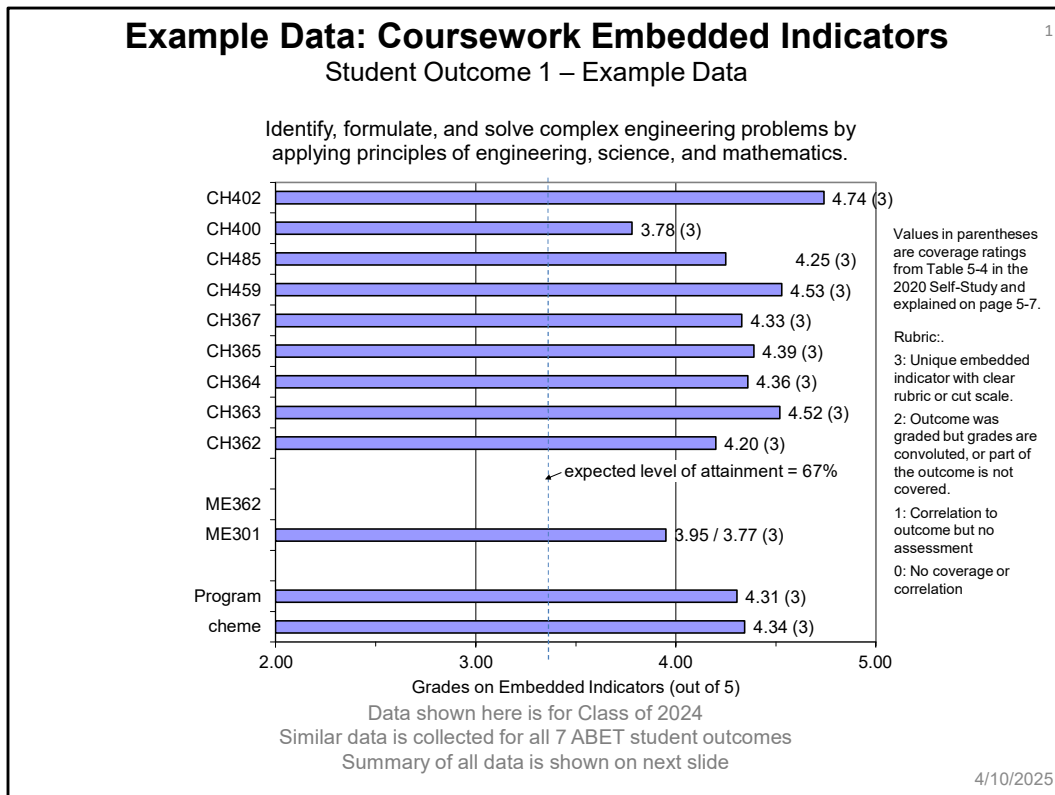
We look forward to hosting you at our next Advisory Board Meeting in 2026 following the completion of our ABET Record Academic Year 2025-2026 as we prepare for our on-site visit from the ABET Professional Evaluator in Fall of 2026.

Thank you again for your continued support and service to the Chemical Engineering Program and The Academy.

I am happy to virtually meet you at any time to discuss any questions you may have on the assessment data pack, or any other contents so please let me know.

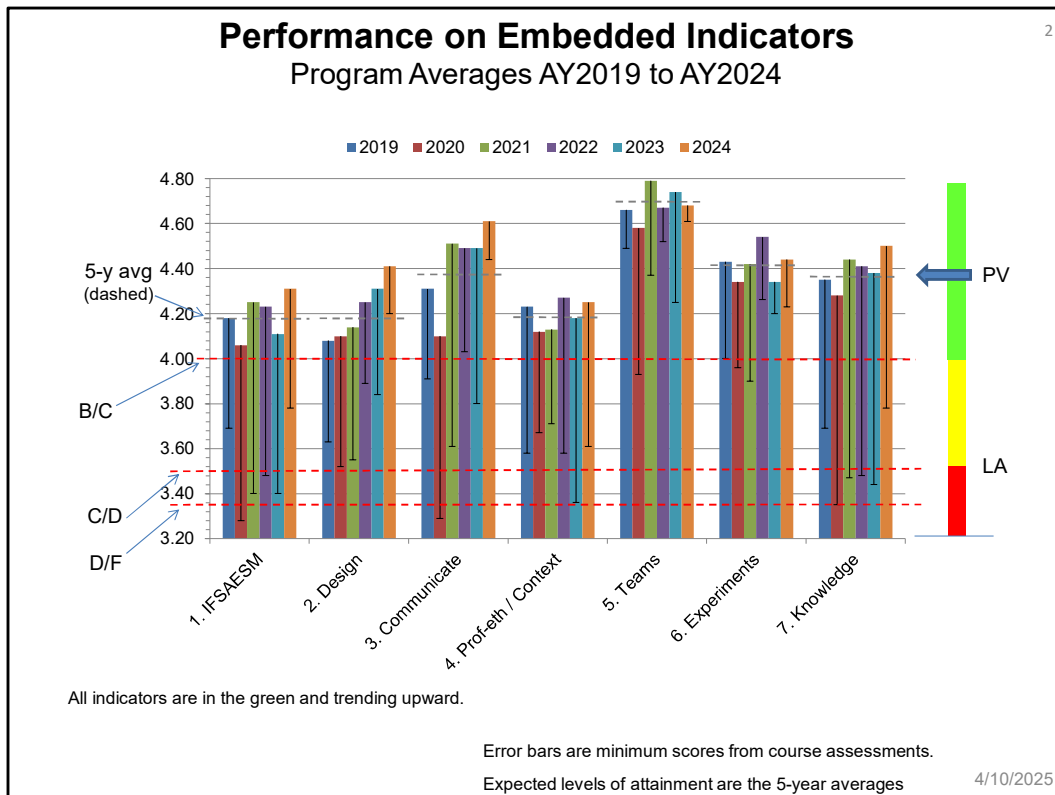
Sincerely,

Enoch A. Nagelli, Ph.D.  
Associate Professor  
Director, Chemical Engineering Program  
Department of Chemistry & Life Science  
Bartlett Hall, Room 433A  
United States Military Academy, West Point, NY 10996  
W: 845.938.3904  
C: 630.452.3653

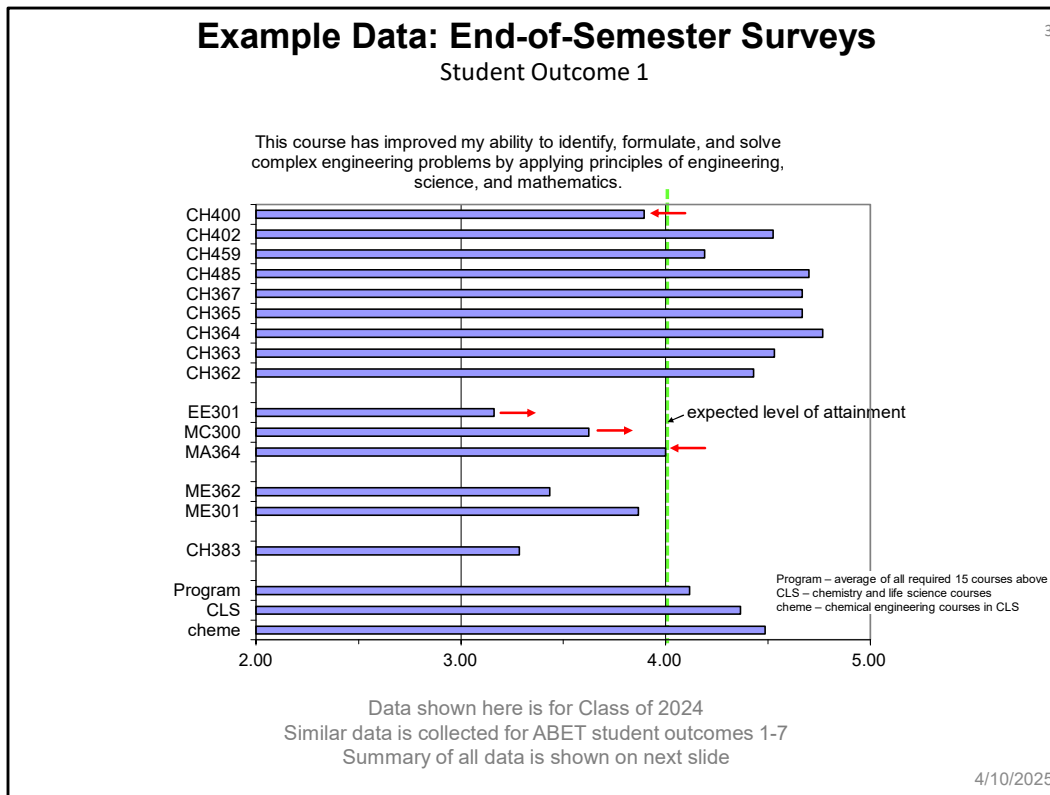


**Slide updated 31 July 2024.** This slide shows the embedded indicator results from the courses (from the 1/0 spreadsheets) for student outcome 1. These results are averages for graded events in the courses that assess this outcome. The values at the bottom of the chart are for comparison and are averages for all program courses (CE+ME) and for CE courses only. The values in parentheses are coverage ratings determined after careful analysis of the indicators determined with the rubric shown. The line indicating level of attainment is the D/F cutoff per standard Dean's cut scale (i.e., 66.7% or 3.33 out of 5). Mechanical engineering courses have two scores, the first being for chemical engineering cadets and the second is the course-wide average. The complete set of data for all student outcomes is included in the program assessment data packet.

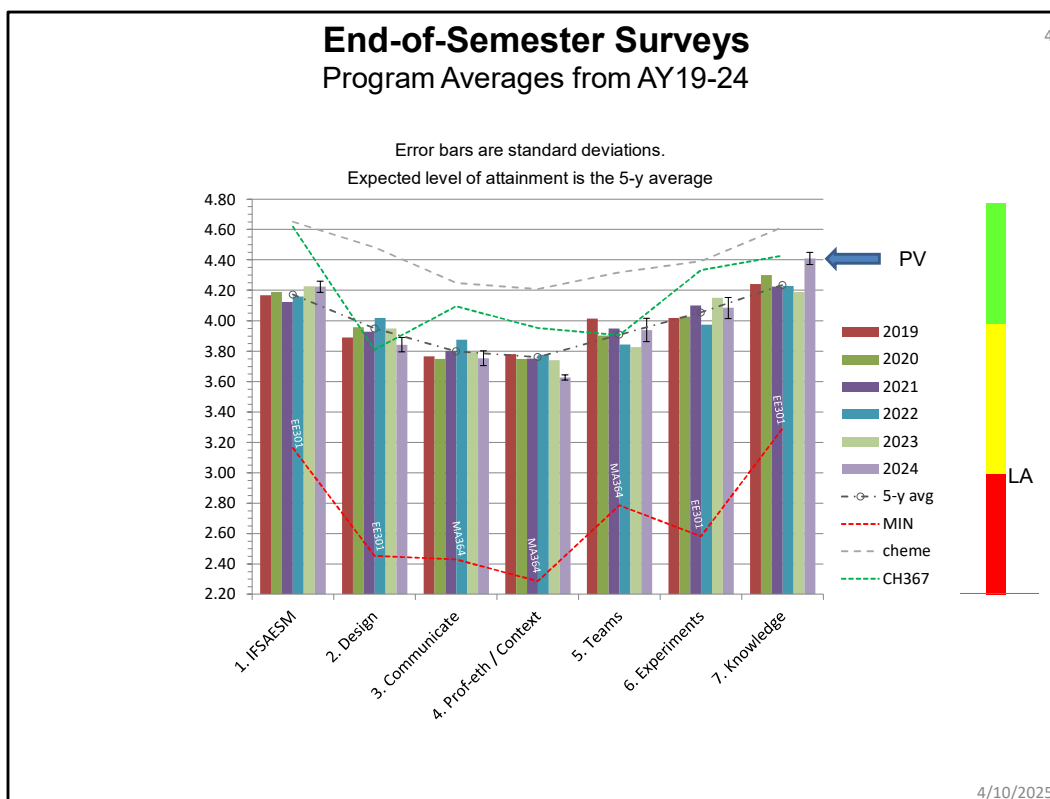
Note: Mechanical engineering courses have two scores, one for chemical engineering students and one course-wide.



**Slide updated 31 July 2024.** Program averages are shown for all courses containing embedded indicators. The green, yellow, and red bars on the right mimic a process control indicator, where the 2024 score (orange vertical data bar) is the measured process variable (PV), and the 5-year average is our performance goal (gray dotted line). The “low alarm” is indicated with “LA” and would trigger program (process) response. In the language of process control, our process is “in the green” for all outcomes. The error bars are minimum scores from courses. For example, the orange bar for 2024 in outcome 1 shows a minimum score of 3.78, from CH400 on the previous slide (slide 1).



**Slide updated 28 May 2024.** At the end of each semester, cadets are asked how their current courses contributed to the student outcomes (self-perception of their abilities in each ABET student outcome). We call this the “end-of-semester” survey. The line indicating the expected level of attainment is 4.0 on the survey, which is a standard “good” score on a 1-5 Likert scale and is also about equal to the survey average over the previous 5 years (4.24/5.00). The summary data on the next slide shows averages of this data from all courses for each outcome, and the complete set of data is shown in the program assessment data packet. The red arrows indicate large changes from last year ( $>\sim\pm 0.5$ ).



**Slide updated 28 May 2024.** At the end of each semester, cadets are asked how their courses contributed to the student outcomes (self-perception of their abilities in each ABET 1-7 student outcome). We call this the end-of-semester “student outcomes survey.” Individual data are shown in the program assessment data packets, and an example for a single student outcome (outcome 1) is shown on the previous slide. To analyze year-to-year trends, this slide (slide 4) shows the yearly averages of the survey results for all outcomes, with each outcome averaged over all courses. Survey results are “normalized” by subtracting survey averages to remove year-to-year bias. The five-year average (5-y avg) is shown for comparison. The chemical engineering courses in the department (cheme) are also shown for comparison. The minimum scores in each outcome are shown by the red dotted line.

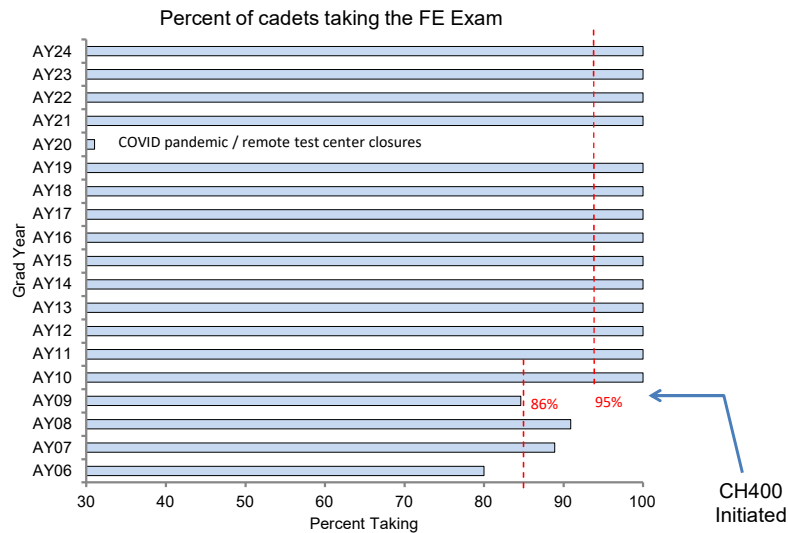
The red dotted line represents the minimum score in the survey, (in order, EE301, EE301, EE301, EE301, CH383, EE301, and EE301). These courses tend to change year-to-year. In AY23 (one year ago), for example, the minimum scores were dominated by EE301, and in AY22 (two years ago), the minimum scores were dominated by MC300. Prior to 2019, the controls course (XE472) was the lowest course in the survey and was also the minimum in each outcome every year. The new controls course (CH367, dotted green line), is now significantly higher and near the average for the chemical engineering courses in D/CLS.

The green, yellow, and red bars on the right are meant to mimic a process control indicator, where the 2024 score is the measured process variable (PV) and the 5-year average is our comparison point. For example, in student outcome 7, the 2024 value is above the 5-year average 4.41 versus 4.24. In the language of process control, our indicator is “in the green” if we are at or above the 5-year average. The “low alarm” is indicated with “LA” and would trigger some kind of process response. For example, introducing CH367 was a response to low alarm in the process control course (XE472) which was consistent over many years. We are mostly “in the green” for AY24, with outcome 4 being somewhat low.

# Fundamentals of Engineering Exam

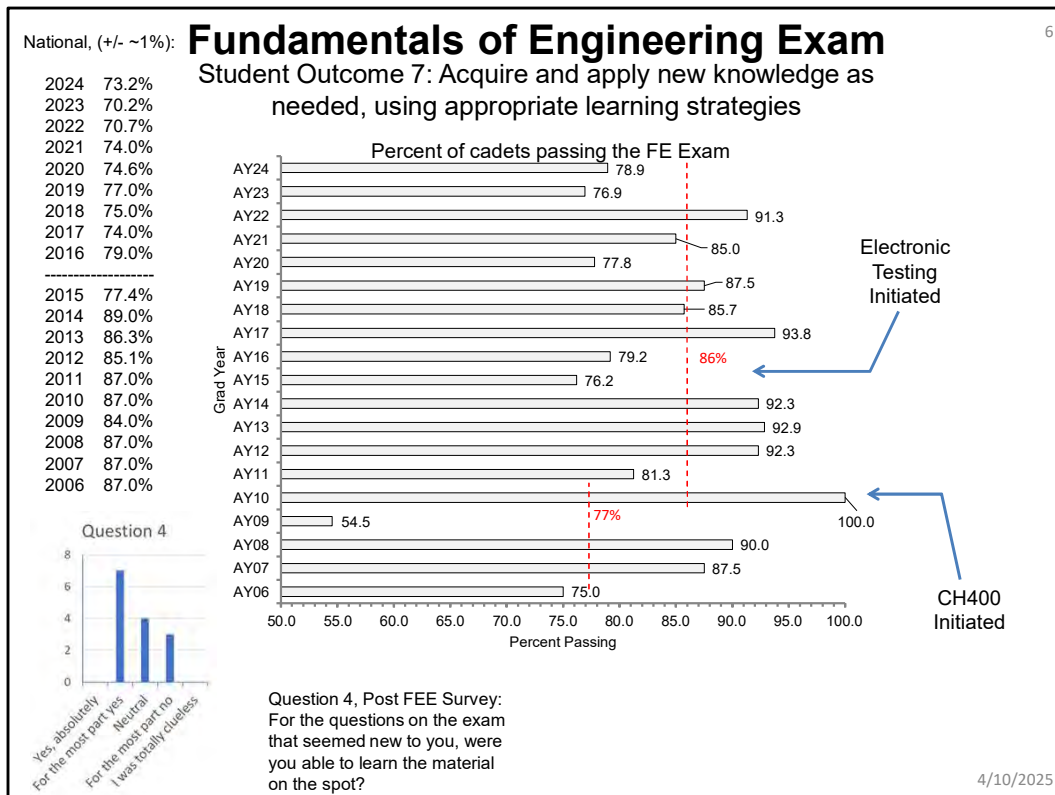
5

Student Outcome 7: Acquire and apply new knowledge as needed, using appropriate learning strategies

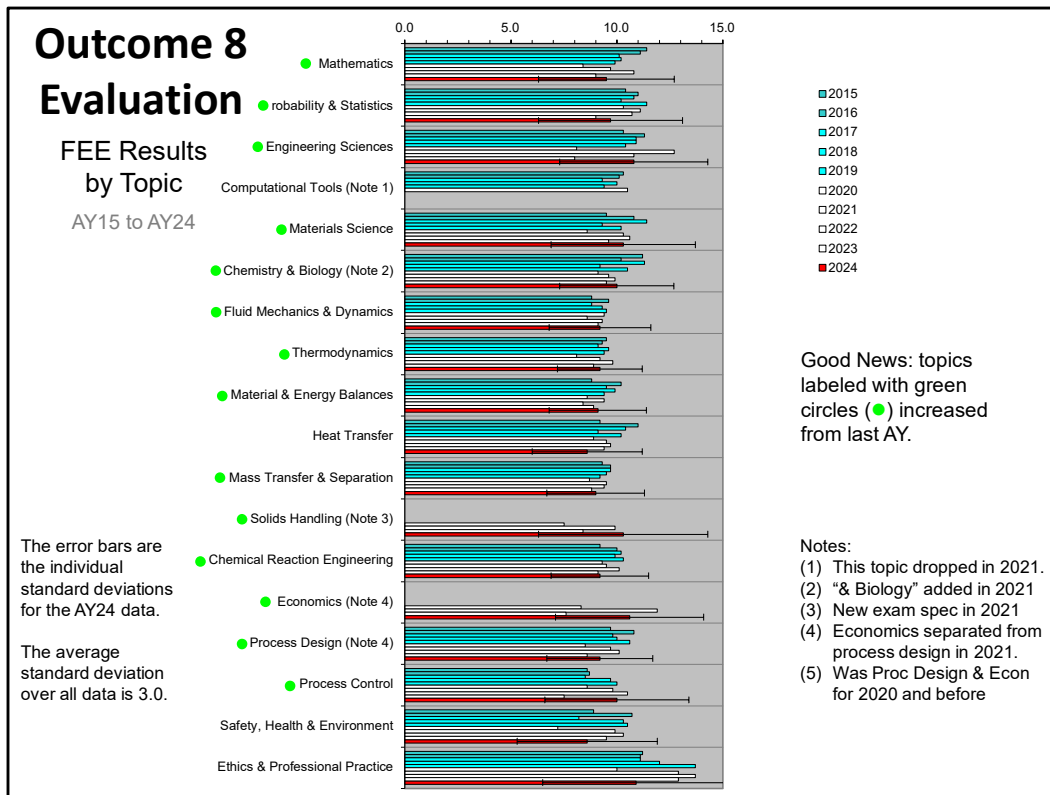


4/10/2025

**Slide updated 25 July 2024.** The percentage of cadets taking the exam is associated with willingness to pursue professional licensure and career development and is a marker of recognition of the needs for life-long learning. The drop in AY20 was due to closure of the NCEES test centers during the COVID-19 pandemic.

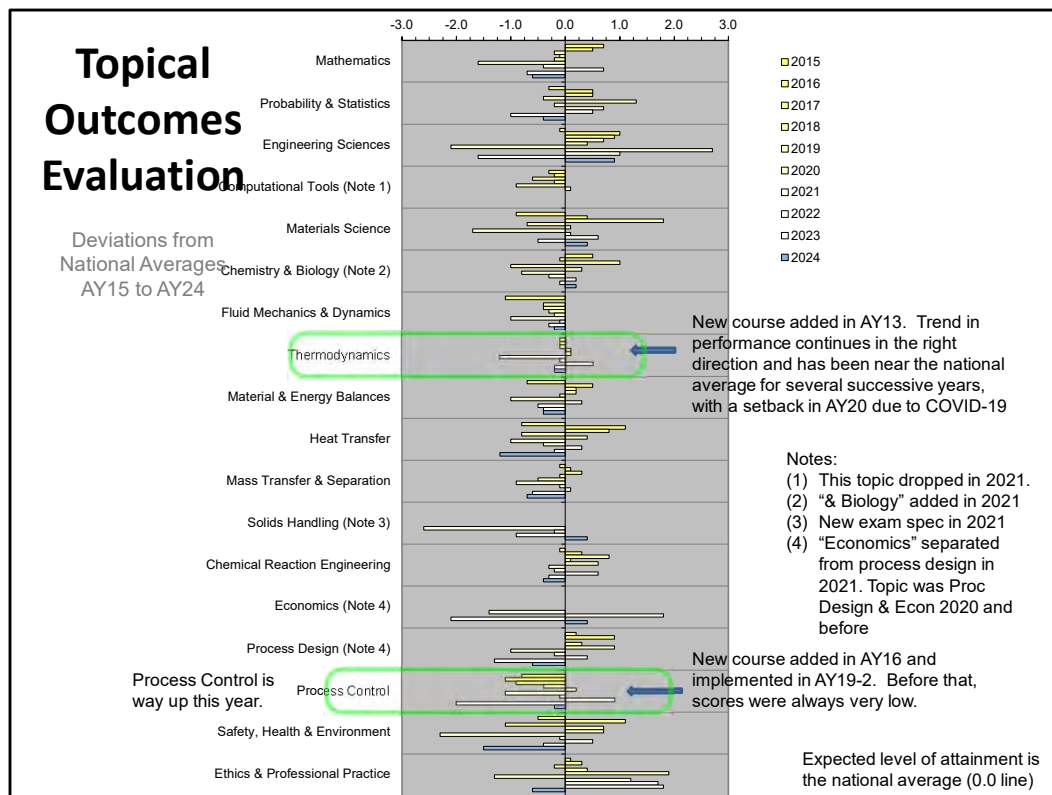


**Slide updated 10 April 2023.** The percentage of cadets passing the FE exam is associated with cadets' ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics.



**Slide updated 25 July 2024.** This data is contained in the report we receive each year from NCEES. Cadet scores are reported to us as an average performance index, which is a normalized score on a scale of 0 to 15.

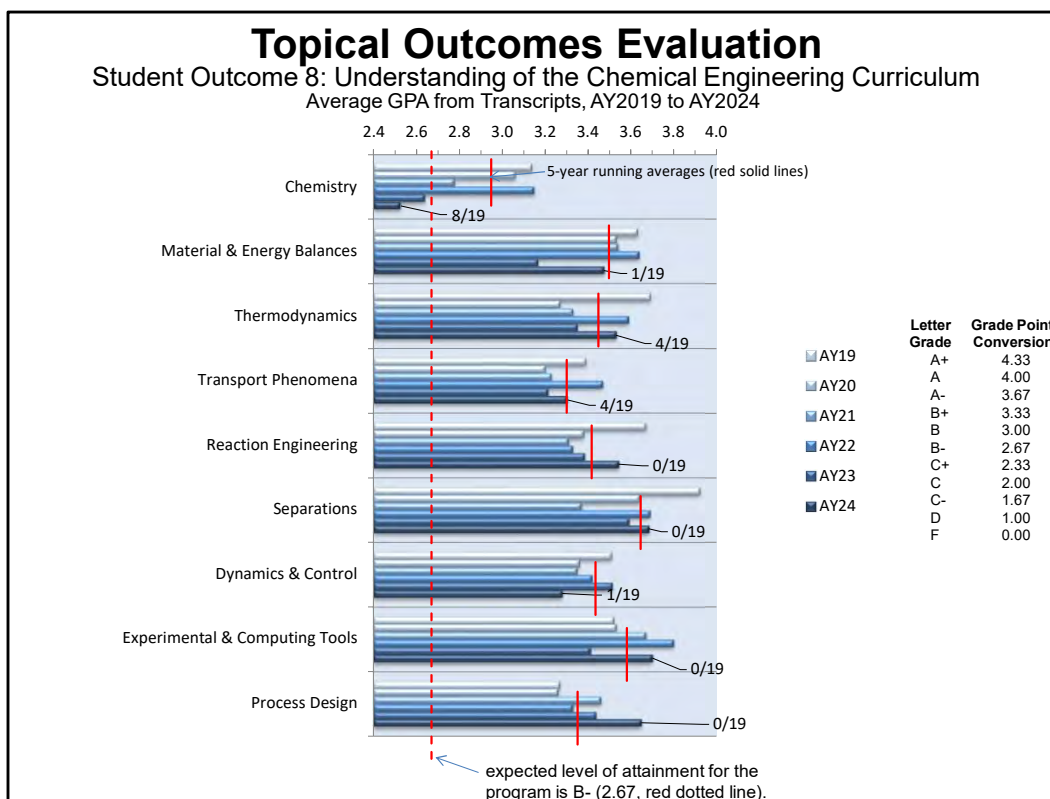




**Slide updated 11 July 2023.** The slide shows normalized FEE data, broken down by subject.

Scores are near the national average in Thermodynamics for the last two years. Process control is near the national average but the score is way up this year. These two are important because they show we are attempting to improve cadet performance on our student outcomes. In the ABET assessment process, we must demonstrate that we are assessing performance and that we are responding to performance indicators. We must also demonstrate that the department is willing to commit resources to the improvement process. These two features form the heart of the ABET process. The addition of these two courses demonstrates our effort to achieves this. We also have documentary evidence to show exactly why we made the changes.

While we are not required to show improvement, we are required to track progress to see if improvement occurs.



**Slide updated 28 May 2024.** This slide contains averages of course letter grades in the topic-specific courses in the program, as obtained from each cadet's final transcript. The averages are shown as a grade point averages (GPA). The GPA scale is 0 to 4.33, as shown in the table at far right. The expected level of attainment in the program is 2.67 (B-, red dotted line), and the 5-year running average for the previous five years is shown as red solid lines. Data labels (e.g. 8/19) are the number of students below B- (C+ or lower).

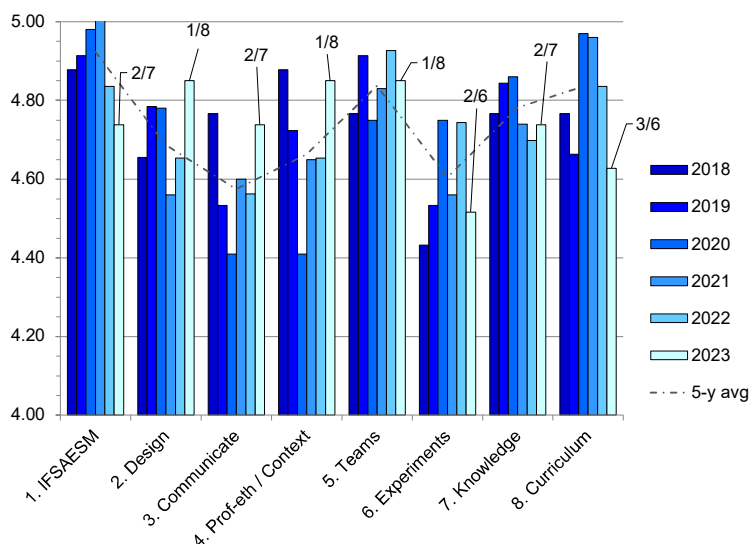
# Advisory Board Student Outcomes Surveys

10

## Student Outcomes 1-8

Program Averages from AY18-23

Data labels are response frequencies for 4 or 5 (# of 4s / # of 5s) on the 1-5 Survey Likert Scale  
Standard deviations range from .00 to .52



4/10/2025

**Slide updated 28 May 2024.** The chemical engineering advisory board is asked to rate performance of cadets on student outcomes, based on data presented to the board at the advisory board meetings. Data for AY2018 to AY2023 is shown here after the most recent advisory board meeting on 14-15 April 2024. Data for AY2024 are not available until after the advisory board meeting in spring of 2025. Data are normalized to compensate for year-to-year fluctuations in the survey average, which places all survey years and board compositions on the same basis. Data labels are response frequencies for 4 or 5 (# of 4s / # of 5s) on the 1-5 survey Likert scale. For example, in outcome 1 IFSAESM, 7 out of 9 board members responded with a 5 and there were two responses of 4, so the label is 2/7. Outcomes 2, 3, and 4 were relative lows last year and are up this year, and outcome 6 is the relative low. The five-year average is the dotted line.

# PROGRAM ASSESSMENT DATA AY2024

UNITED STATES MILITARY ACADEMY  
DEPARTMENT OF CHEMISTRY AND LIFE SCIENCE  
CHEMICAL ENGINEERING PROGRAM  
October 7, 2024

<u>Student Outcome</u>	<u>Page</u>
1.....	<a href="#">1</a>
2.....	<a href="#">3</a>
3.....	<a href="#">5</a>
4.....	<a href="#">7</a>
5.....	<a href="#">9</a>
6.....	<a href="#">12</a>
7.....	<a href="#">14</a>
8.....	<a href="#">19</a>

<u>Evaluations</u>	
Faculty.....	<a href="#">21</a>
Advisory Board.....	<a href="#">22</a>
Program Director .....	<a href="#">23</a>



### Level of Achievement of Student Outcome 1:

On completion of the chemical engineering program, our graduates will be able to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics.

#### *Assessment Instruments and Frequency:*

1. Chemical & Mechanical Engineering Coursework Embedded Indicators, once/yr.
2. Fundamentals of Engineering Examination, once/yr.
3. End-of-Semester Student Surveys, once/semester.
4. Chemical Engineering Program Exit Survey, once/yr.

#### *Assessment Results:*

1. Chemical & Mechanical Engineering Coursework Embedded Indicators

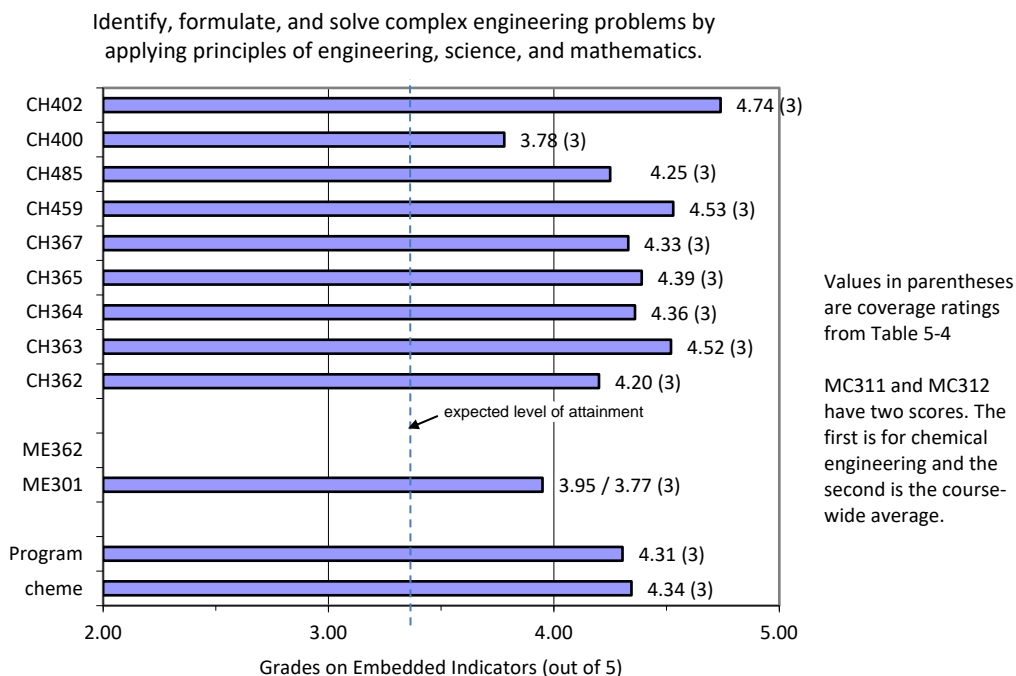


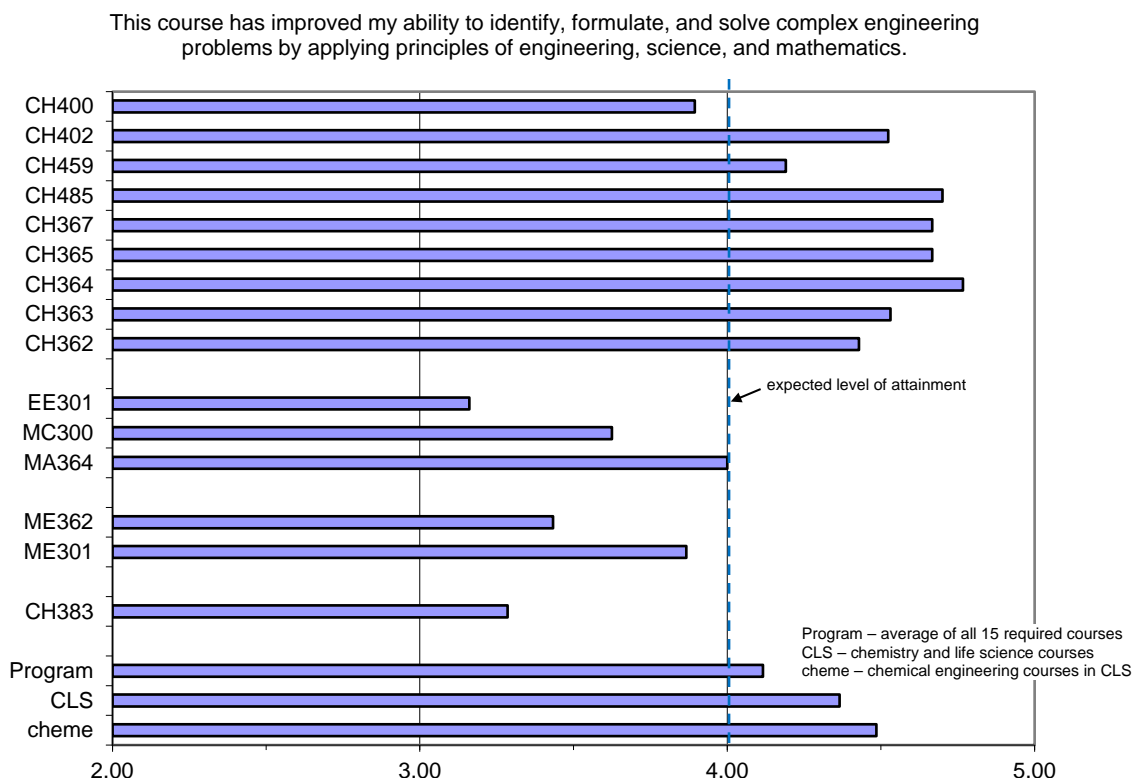
Figure 1-1. Coursework Embedded Indicator results for Student Outcome 1.

2. Fundamentals of Engineering Examination (FEE). According to the 2024 report from NCEES, 14 out of 19 cadets in the Class of 2024 took and passed the FEE. After one successful re-take, our program is at 15 out of 19, or 78.9%. The national average passing in 2024 was 73.2%, and this is our expected level of attainment. In the previous five years, the pass rates were 76.9% in 2023, 91.3% in 2022, 85.0% in 2021, 77.8% in 2020, and 87.5% in 2019. Our running average over those previous five years is  $83.7\% \pm 6.2\%$  (versus  $73.3\% \pm 2.2\%$  for the national average).

Note: We assess our program against the national average, which is our expected level of attainment, and we are **above** the national average for the pass rate for the past six years.

3. End of Semester Student Surveys

Figure 1-2. End-of-Semester Student Survey responses for Student Outcome 1.



4. Chemical Engineering Program Exit Survey. This survey is issued to Firsties at the end of their last semester. In this question, they were asked whether they agree with the statement “The program has prepared me to Identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics.” 21 out of 21 cadets completed the survey, including 1 studies cadet and one class of 2025 (turnback). Of these, 21 out of 21 cadets said that they either agreed or strongly agreed (score = 5/5 or 4/5), with 19/21 replying that they strongly agreed (score = 5/5) and two cadets replying that they agreed (score = 4/5). This equates to a mean score of  $4.91/5.00 \pm 0.30$  for the 21 cadets participating in the survey. The expected level of attainment on this survey is 4.00/5.00.

### Level of Achievement of Student Outcome 2:

On completion of the chemical engineering program, our graduates will be able to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors.

#### *Assessment Instruments and Frequency:*

1. Chemical & Mechanical Engineering Coursework Embedded Indicators, once/yr.
2. End of Semester Student Surveys, once/semester.
3. Course Grades in CH402 Chemical Engineering Process Design, once/yr.
4. Chemical Engineering Program Exit Survey, once/yr.

#### *Assessment Results:*

1. Chemical & Mechanical Engineering Coursework Embedded Indicators

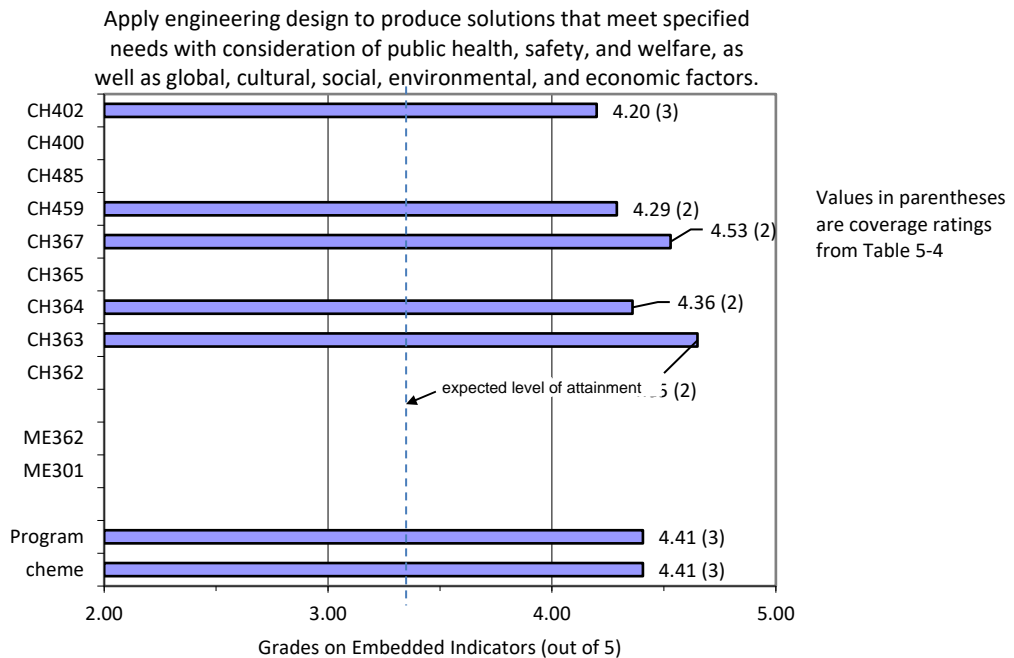


Figure 2-1. Coursework Embedded Indicator results for Student Outcome 2.



## 2. End of Semester Student Surveys

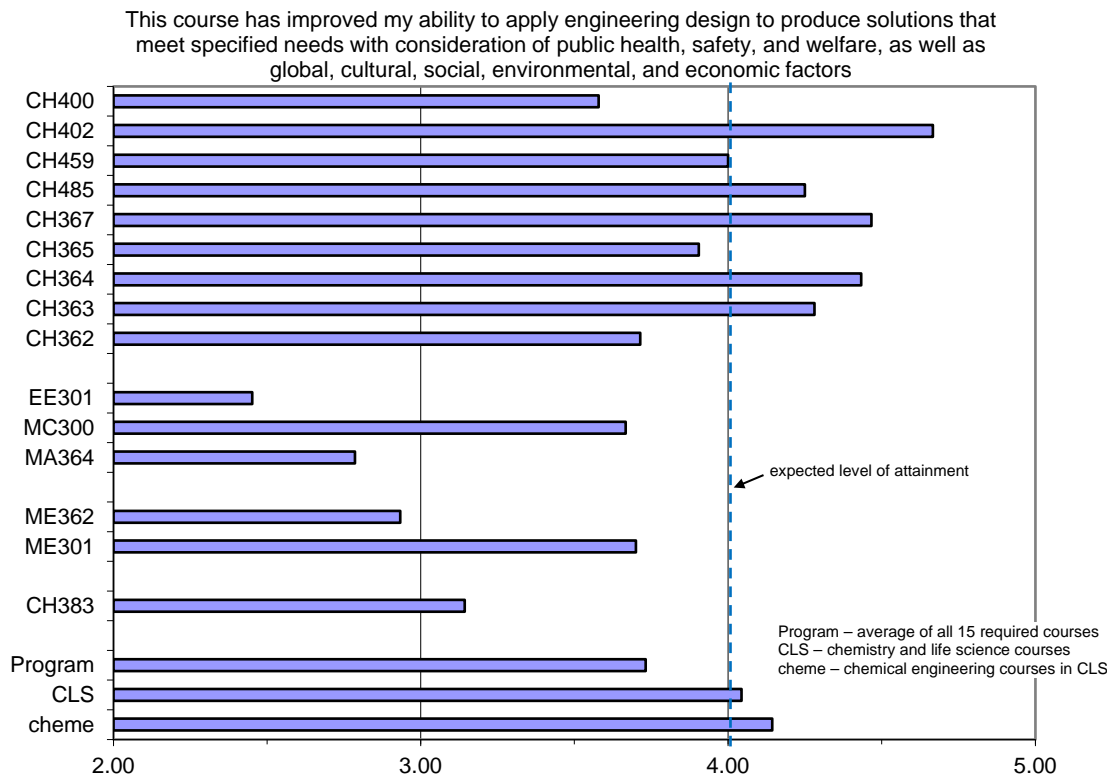


Figure 2-2. End-of-Semester Student Survey responses for Student Outcome 2.

- The average course grade in CH402 Chemical Engineering Process Design was  $3.65 \pm 0.46$  ( $n=19$ ) in AY24, compared to  $3.44 \pm 0.55$  ( $n=13$ ) in AY23,  $3.33 \pm 0.50$  ( $n=23$ ) in AY22,  $3.46 \pm 0.68$  ( $n=20$ ) in AY21,  $3.26 \pm 0.70$  ( $n=29$ ) in AY20, and  $3.27 \pm 0.92$  ( $n=21$ ) in AY19. The 5-year running average for the previous five years is 3.35, and this is our expected level of attainment. This year's score was *above* the 5-year running average.
- Chemical Engineering Program Exit Survey. As stated earlier, this survey is given to Firsties at the end of their last semester. In this question, they were asked whether or not they agree with the statement "The program has prepared me to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors." 21 out of 21 cadets completed the survey, including 1 studies cadet and one class of 2025 (turnback). Of these, 20 out of 21 cadets said that they either agreed or strongly agreed (score = 5/5 or 4/5), with 12/21 replying that they strongly agreed (score = 5/5), 8/21 replying that they agreed (score = 4/5), and 1/21 that they were neutral (score = 3/5). This equates to a mean score of  $4.52/5.00 \pm 0.60$  for the 21 cadets. The expected level of attainment on this survey is 4.00/5.00.

### Level of Achievement of Student Outcome 3:

On completion of the chemical engineering program, our graduates will be able to communicate effectively with a range of audiences.

#### *Assessment Instruments and Frequency:*

1. Chemical & Mechanical Engineering Coursework Embedded Indicators, once/yr.
2. End of Semester Student Surveys, once/semester.
3. Course Grades in CH459 Unit Operations Laboratory, once/yr.
4. Chemical Engineering Program Exit Survey, once/yr.

#### *Assessment Results:*

1. Chemical & Mechanical Engineering Coursework Embedded Indicators

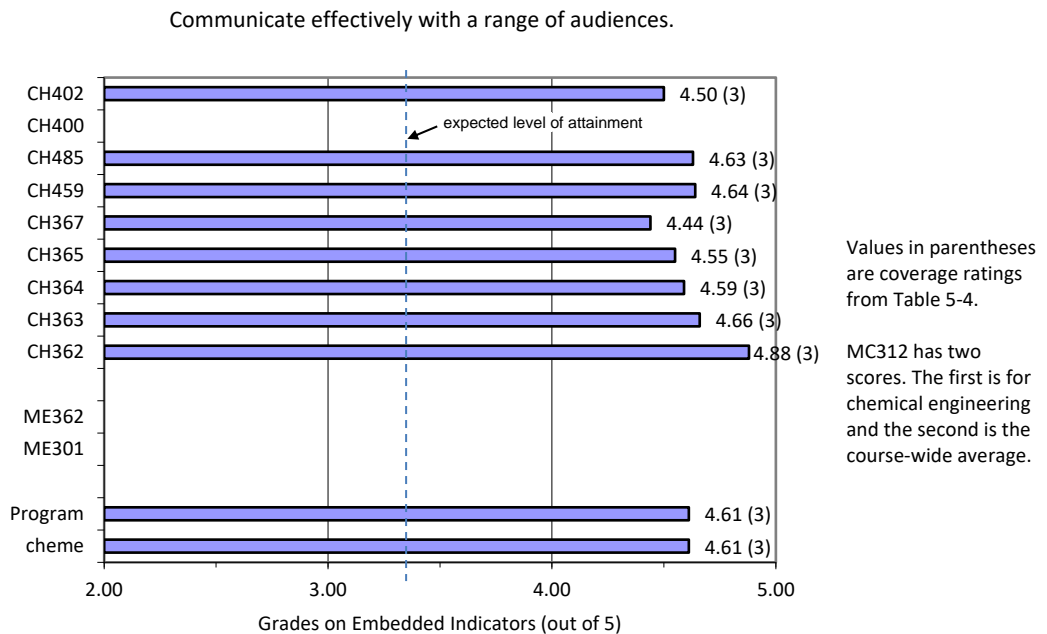


Figure 3-1. Coursework Embedded Indicator results for Student Outcome 3.

## 2. End of Semester Student Surveys

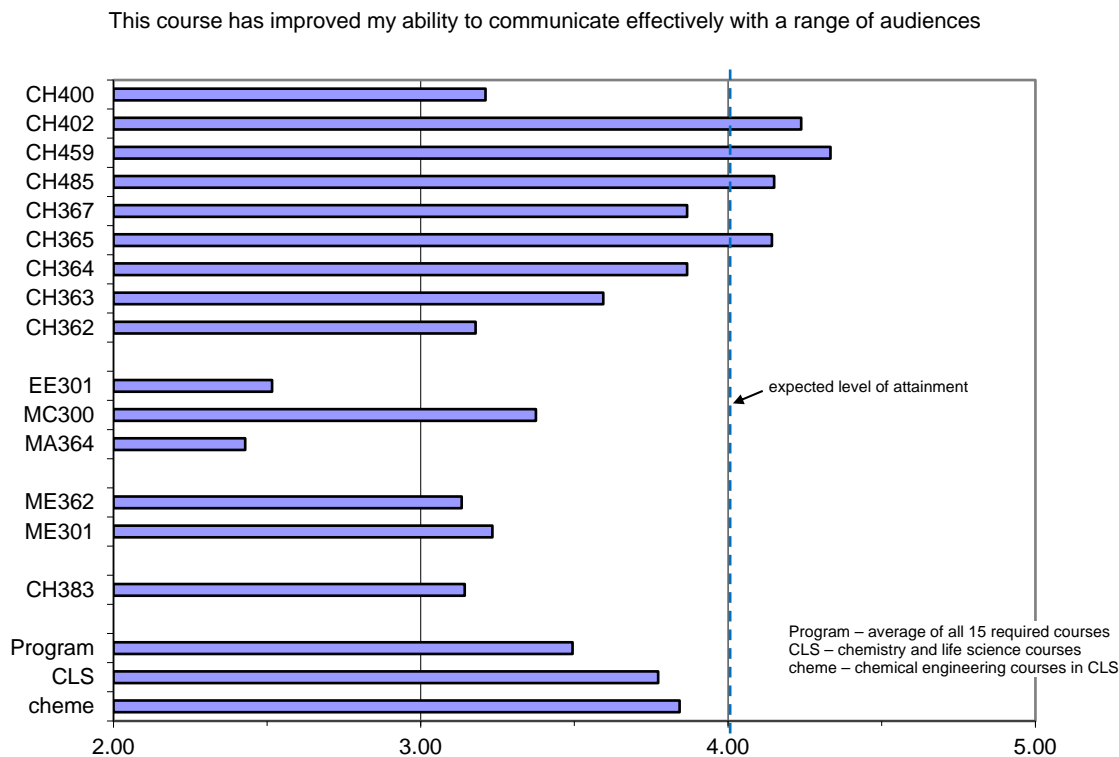


Figure 3-2. End-of-Semester Student Survey responses for Student Outcome 3.

3. The average course grade in CH459 Chemical Engineering Laboratory was  $3.70 \pm 0.46$  ( $n=19$ ) in AY24, compared to  $3.41 \pm 0.43$  ( $n=13$ ) in AY23,  $3.80 \pm 0.42$  ( $n=23$ ) in AY22,  $3.67 \pm 0.53$  ( $n=18$ ) in AY21,  $3.53 \pm 0.48$  ( $n=29$ ) in AY20, and  $3.52 \pm 0.44$  ( $n=19$ ) in AY19. The 5-year running average is 3.59, and this is our expected level of attainment. This year's score was above the 5-year running average.
4. Chemical Engineering Program Exit Survey. As stated earlier, this survey is given to Firsties at the end of their last semester. In this question, they were asked whether they agree with the statement "The program has prepared me to communicate effectively with a range of audiences." 21 out of 21 cadets completed the survey, including 1 studies cadet and one class of 2025 (turnback). Of these, 21 out of 21 cadets said that they either agreed or strongly agreed (score = 5/5 or 4/5), with 10/21 replying that they strongly agreed (score = 5/5), and 11/21 replying that they agreed (score = 4/5). This equates to a mean score of  $4.48/5.00 \pm 0.51$  for the 21 cadets. The expected level of attainment on this survey is 4.00/5.00.

#### **Level of Achievement of Student Outcome 4:**

On completion of the chemical engineering program, our graduates will be able to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts.

#### ***Assessment Instruments and Frequency:***

1. Chemical & Mechanical Engineering Coursework Embedded Indicators, once/yr.
2. Fundamentals of Engineering Examination Performance Index, once/yr.
3. End of Semester Student Surveys, once/semester.
4. Chemical Engineering Program Exit Survey, once/yr.
5. Completion of Cadet Character Education Program, once/yr.

#### ***Assessment Results:***

1. Chemical & Mechanical Engineering Coursework Embedded Indicators

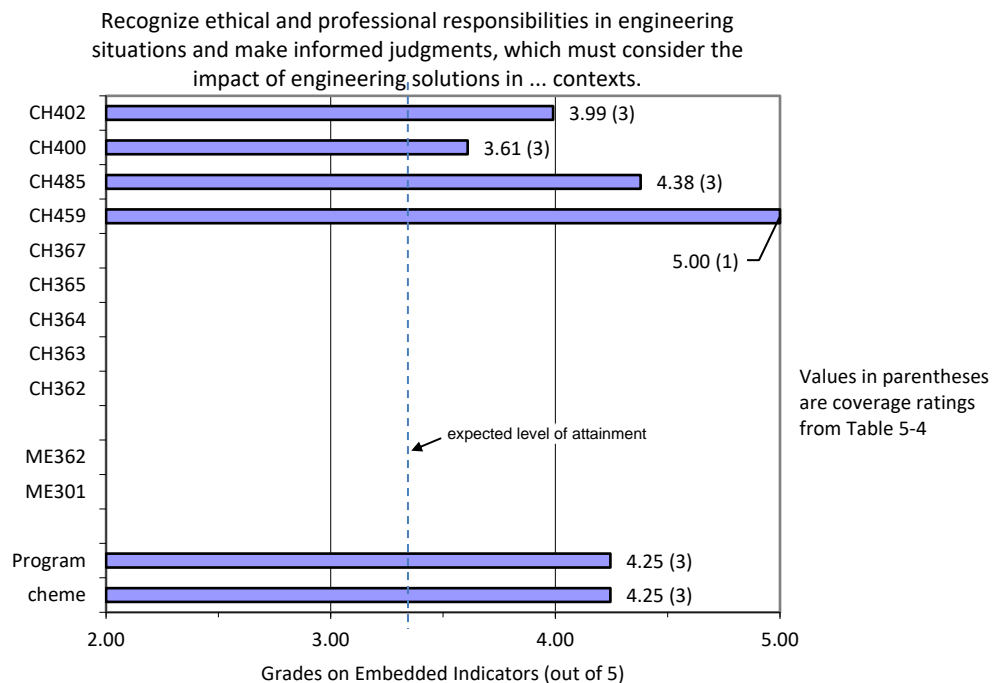


Figure 4-1. Coursework Embedded Indicator results for Student Outcome 4.

2. Fundamentals of Engineering Examination Performance, Self-Study Table 4-2.

Subject	Outcome	Questions	USMA	National (Expected level of attainment)
Ethics and Professional Practice	4	3	10.9	11.5 ± 4.4
Economics	4	4	10.6	10.2 ± 3.4

Note: the national average is our expected level of attainment, and we are within the standard deviation reported by NCEES.

### 3. End of Semester Student Surveys

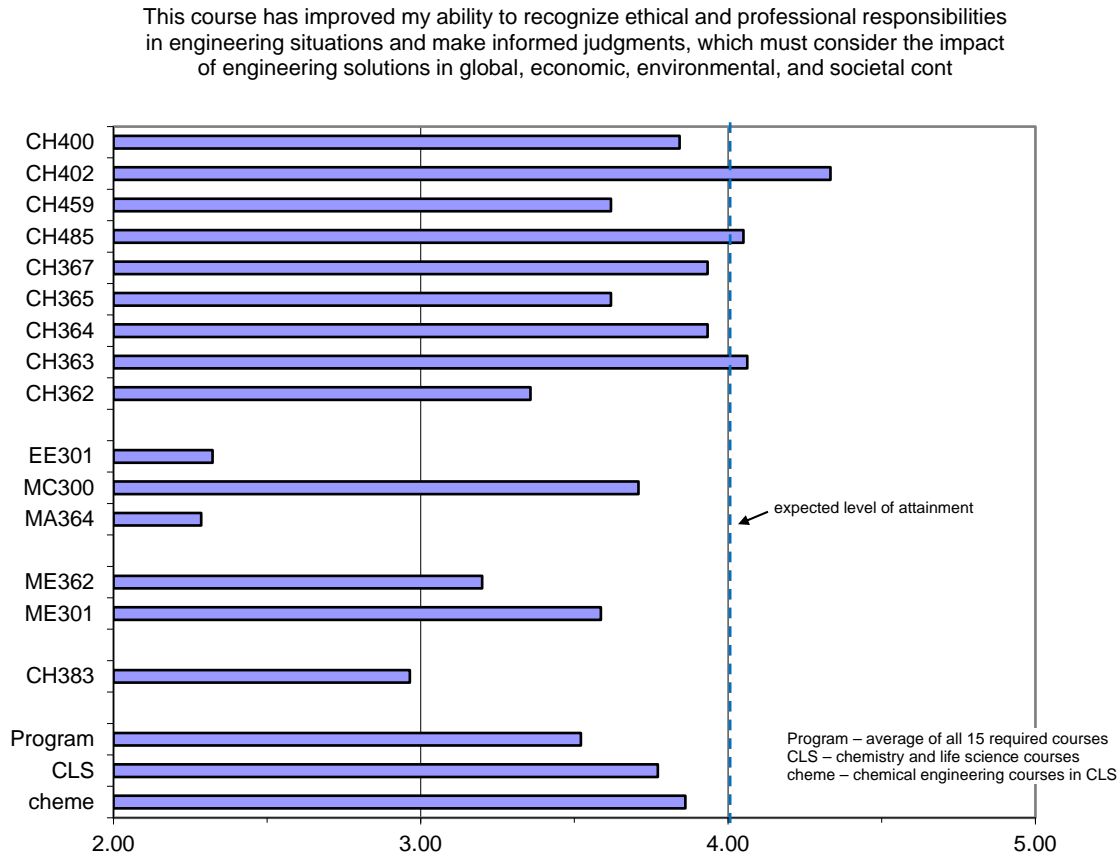


Figure 4-2. End-of-Semester Student Survey responses for Student Outcome 4.

4. Chemical Engineering Program Exit Survey. This survey is given to the Firsties at the end of their last semester. Cadets were asked to respond to the statement “The program has prepared me to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts.” 21 out of 21 cadets completed the survey, including 1 studies cadet and one class of 2025 (turnback). Of these, 17 out of 21 cadets said that they either agreed or strongly agreed (score = 5/5 or 4/5), with 9/21 replying that they strongly agreed (score = 5/5), 8/21 replying that they agreed (score = 4/5), and 4/21 replying that they were neutral (score = 3/5). This equates to a mean score of  $4.24/5.00 \pm 0.77$  for the 21 cadets. The expected level of attainment is 4.00/5.00.
5. Training in honor and ethics takes place in the Cadet Character Education Program (CCEP) during the academic year and summer terms. The program is overseen by the Commandant of Cadets through the Simon Center for the Professional Military Ethic. CCEP customizes instruction to each of the four year-groups of cadets, who interact with faculty volunteers who share their perspectives and experience in the Armed Forces, with industry, and at other civilian institutions. All 23 chemical engineering cadets successfully completed the 4-year CCEP program.

### Level of Achievement of Student Outcome 5:

On completion of the chemical engineering program, our graduates will be able to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives.

#### *Assessment Instruments and Frequency:*

1. Chemical & Mechanical Engineering Coursework Embedded Indicators, once/yr.
2. End of Semester Student Surveys, once/semester.
3. Chemical Engineering Program Exit Survey, once/yr.
4. Multidisciplinary Skills Rubric, once/yr.

#### *Assessment Results:*

##### 1. Chemical & Mechanical Engineering Coursework Embedded Indicators

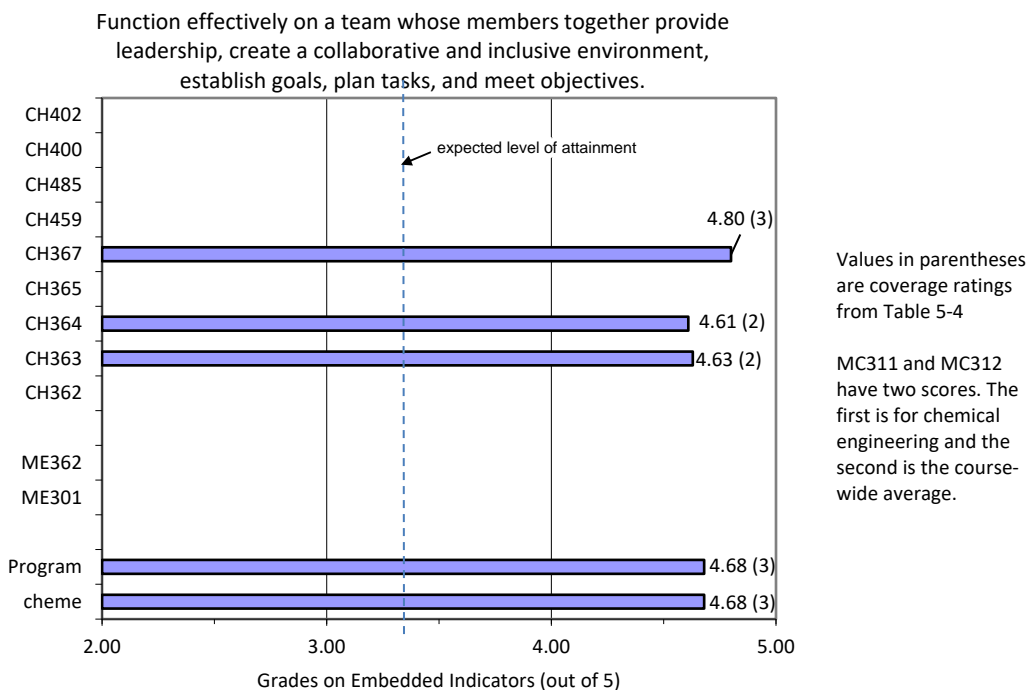


Figure 5-1. Coursework Embedded Indicator results for Student Outcome 5.

## 2. End of Semester Student Surveys

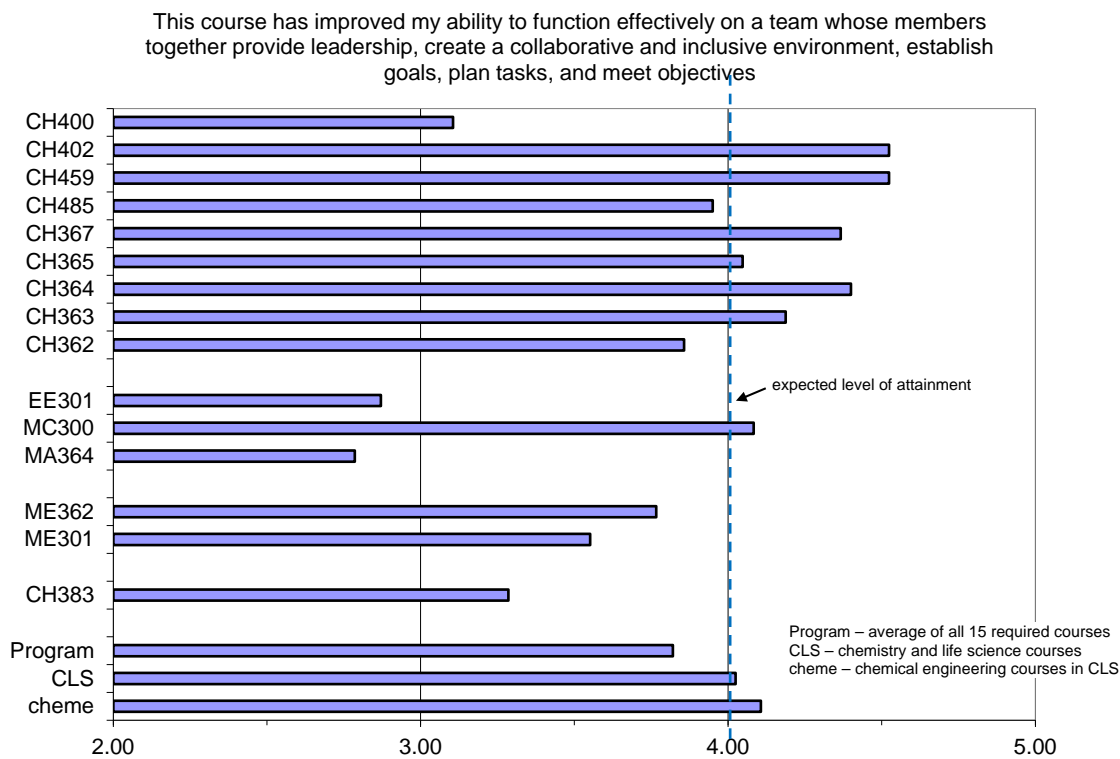


Figure 5-2. End-of-Semester Student Survey responses for Student Outcome 5.

3. Chemical Engineering Program Exit Survey. As stated earlier, this survey is given to the Firsties at the end of their last semester. In this question, they were asked whether or not they agree with the statement “The program has prepared me to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives.” 21 out of 21 cadets completed the survey, including 1 studies cadet and one class of 2025 (turnback). Of these, 21 out of 21 cadets said that they either agreed or strongly agreed (score = 5/5 or 4/5), with 17/21 replying that they strongly agreed (score = 5/5) and 4/21 replying that they agreed (score = 4/5). This equates to a mean score of  $4.81/5.00 \pm 0.40$  for the 21 cadets. The expected level of attainment on this survey is 4.00/5.00.
4. Teamwork Skills Rubric. The rubric is used to assess performance in four skills associated with the ability to function on effectively on a team, namely technical competence, communication, organization, and teamwork. The rubrics are completed by the cadets after each laboratory exercise in CH459. The results were averaged over each round-robin and reported below using the actual rubric for formatting. The superscript “a” next to the averages are for team assessment of the group leader (TAL) and “b” designates group leader assessment of the team (GLAT). The expected level of attainment is 4.0. The color shading indicates the



relationship of the averages to the expected level of attainment. Red shading indicates when improvement is needed.

Your Name: Dr. Enoch Nagelli				Person Assessed: Cadets in CH459					
Your Position: CH459 CD				Major of Person Assessed: Chemical Engineering					
	1 – Needs Improvement	1	2	3 – Meets Expectations	3	4	5 – Exceeds Expectations	5	N/A
Technical Competence	Some misunderstandings of the technical content.			Demonstrated knowledge of the technical content.			Exceptional knowledge of technical content.	4.7 <sup>a</sup> ±.17 <sup>c</sup> 4.6 <sup>b</sup> ±.21 <sup>c</sup>	
Communication	Lacked sensitivity and/or did not provide specific suggestions for improvement.			Effectively communicated important points.			Exceptional ability to explain important points. Very effectively communicated ideas for improvement.	4.6 <sup>a</sup> ±.12 <sup>c</sup> 4.6 <sup>b</sup> ±.32 <sup>c</sup>	
Organization	Was not prepared or did not give sufficient time to prepare.			Demonstrated effective organization during class.			Was exceptionally efficient, timely and responsive throughout the entire process.	4.6 <sup>a</sup> ±.09 <sup>c</sup> 4.6 <sup>b</sup> ±.3 <sup>c</sup>	
Teamwork	Demonstrated limited ability to see other perspectives or find common ground.			Worked collaboratively with team members to reach consensus.			Exceptional ability to help group find common ground or resolve conflict in order to ultimately reach consensus.	4.6 <sup>a</sup> ±.09 <sup>c</sup> 4.5 <sup>b</sup> ±.19 <sup>c</sup>	
Are the cadets capable of functioning on multidisciplinary teams? Yes	Comments: Each cadet was group leader twice. Footnote "a" designates the average of all Team Assessments of Leader (TAL) scores, while "b" designates average of all Group Leader Assessment (GLAT) scores. Footnote "c" designates standard deviations.			Footnote "a" designates the average of all Team Assessments of Leader (TAL) scores, while "b" designates average of all Group Leader Assessment (GLAT) scores. Footnote "c" designates standard deviations.		Assignment used for assessment: AY23, Round Robin 1			
Your Name: Dr. Enoch Nagelli				CH459					
Your Position: CH459 CD				Chemical Engineering					
	1 – Needs Improvement	1	2	3 – Meets Expectations	3	4	5 – Exceeds Expectations	5	N/A
Technical Competence	Some misunderstandings of the technical content.			Demonstrated knowledge of the technical content.			Exceptional knowledge of technical content.	4.9 <sup>a</sup> ±.02 <sup>c</sup> 5.0 <sup>b</sup> ±0.0 <sup>c</sup>	
Communication	Lacked sensitivity and/or did not provide specific suggestions for improvement.			Effectively communicated important points.			Exceptional ability to explain important points. Very effectively communicated ideas for improvement.	4.9 <sup>a</sup> ±.05 <sup>c</sup> 5.0 <sup>b</sup> ±0.0 <sup>c</sup>	
Organization	Was not prepared or did not give sufficient time to prepare.			Demonstrated effective organization during class.			Was exceptionally efficient, timely and responsive throughout the entire process.	4.9 <sup>a</sup> ±.02 <sup>c</sup> 5.0 <sup>b</sup> ±0.0 <sup>c</sup>	
Teamwork	Demonstrated limited ability to see other perspectives or find common ground.			Worked collaboratively with team members to reach consensus.			Exceptional ability to help group find common ground or resolve conflict in order to ultimately reach consensus.	4.9 <sup>a</sup> ±.05 <sup>c</sup> 5.0 <sup>b</sup> ±0.0 <sup>c</sup>	
Are the cadets capable of functioning on multidisciplinary teams? Yes	Comments: Each cadet was group leader twice. Footnote "a" designates the average of all Team Assessments of Leader (TAL) scores, while "b" designates average of all Group Leader Assessment (GLAT) scores. Footnote "c" designates standard deviations.			Footnote "a" designates the average of all Team Assessments of Leader (TAL) scores, while "b" designates average of all Group Leader Assessment (GLAT) scores. Footnote "c" designates standard deviations.		Assignment used for assessment: AY22, Round Robin 2			



### Level of Achievement of Student Outcome 6:

On completion of the chemical engineering program, our graduates will be able to develop and conduct appropriate experimentation, analyze, and interpret data, and use engineering judgment to draw conclusions.

#### *Assessment Instruments and Frequency:*

1. Chemical & Mechanical Engineering Coursework Embedded Indicators, once/yr.
2. End-of-Semester Student Surveys, once/semester.
3. Chemical Engineering Program Exit Survey, once/yr.
4. Course Grades in CH459 Unit Operations Laboratory, once/yr.

#### *Assessment Results:*

1. Chemical & Mechanical Engineering Coursework Embedded Indicators

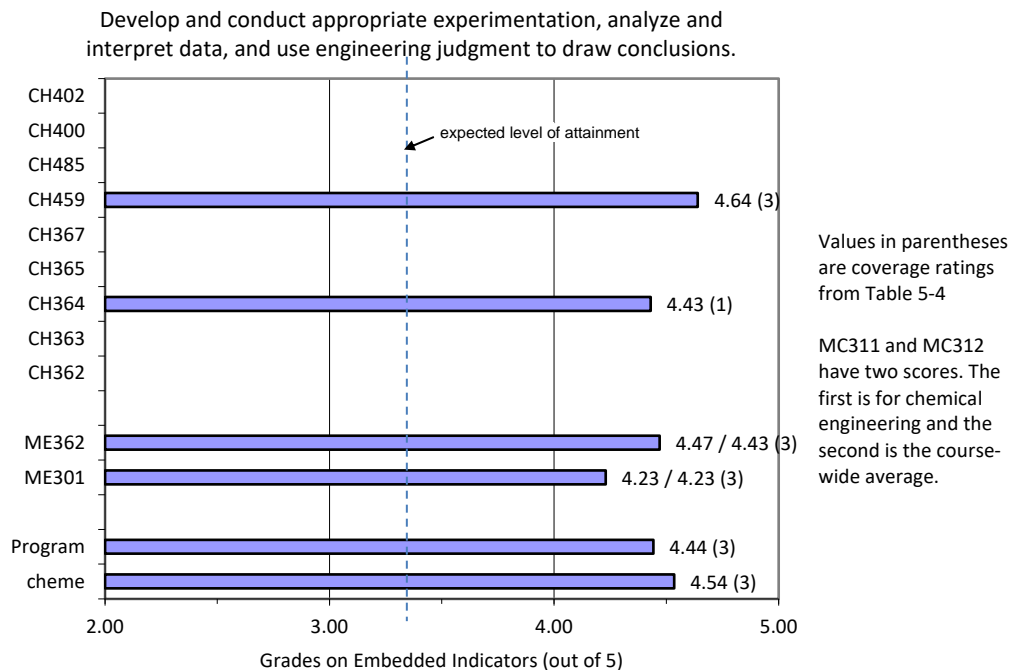


Figure 6-1. Coursework Embedded Indicator results for Student Outcome 6.

## 2. End of Semester Student Surveys

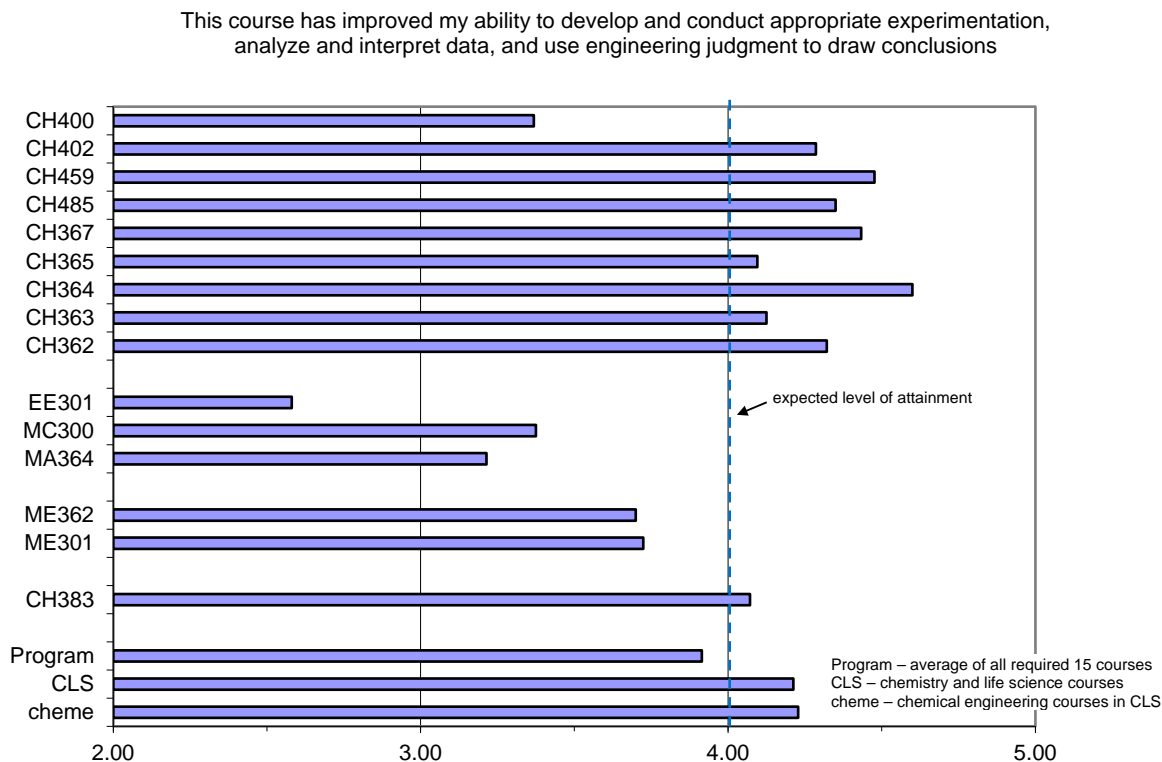


Figure 6-2. End-of-Semester Student Survey responses for Student Outcome 6.

3. Chemical Engineering Program Exit Survey. As stated earlier, this survey is given to the Firsties at the end of their last semester. In this question, they were asked whether they agree with the statement “The program has prepared me to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions.” 21 out of 21 cadets completed the survey, including 1 studies cadet and one class of 2025 (turnback). Of these, 20 out of 21 cadets said that they either agreed or strongly agreed (score = 5/5 or 4/5), with 17/21 replying that they strongly agreed (score = 5/5), 3/21 replying that they agreed (score = 4/5), and 1/21 replying that they were neutral (score = 3/5). This equates to a mean score of  $4.76/5.00 \pm 0.54$  for the 21 cadets. The expected level of attainment on this survey is 4.00/5.00.
4. The average course grade in CH459 Chemical Engineering Laboratory was  $3.70 \pm 0.46$  (n=19) in AY24, compared to  $3.41 \pm 0.43$  (n=13) in AY23,  $3.80 \pm 0.42$  (n=23) in AY22,  $3.67 \pm 0.53$  (n=18) in AY21,  $3.53 \pm 0.48$  (n=29) in AY20, and  $3.52 \pm 0.44$  (n=19) in AY19. The 5-year running average is 3.59, and this is our expected level of attainment. This year’s score was above the 5-year running average.

### Level of Achievement of Student Outcome 7:

On completion of the chemical engineering program, our graduates will be able to acquire and apply new knowledge as needed, using appropriate learning strategies.

#### *Assessment Instruments and Frequency:*

1. Chemical & Mechanical Engineering Coursework Embedded Indicators, once/yr.
2. Percent of eligible students taking the Fundamentals of Engineering Examination (FEE), once/yr.
3. End of Semester Student Surveys, once/semester.
4. Chemical Engineering Program Exit Survey, once/yr.
5. Lifelong Learning Skills Rubric, twice per year.
6. Contemporary Issues Rubric, multiple times per year.

#### *Assessment Results:*

1. Chemical & Mechanical Engineering Coursework Embedded Indicators

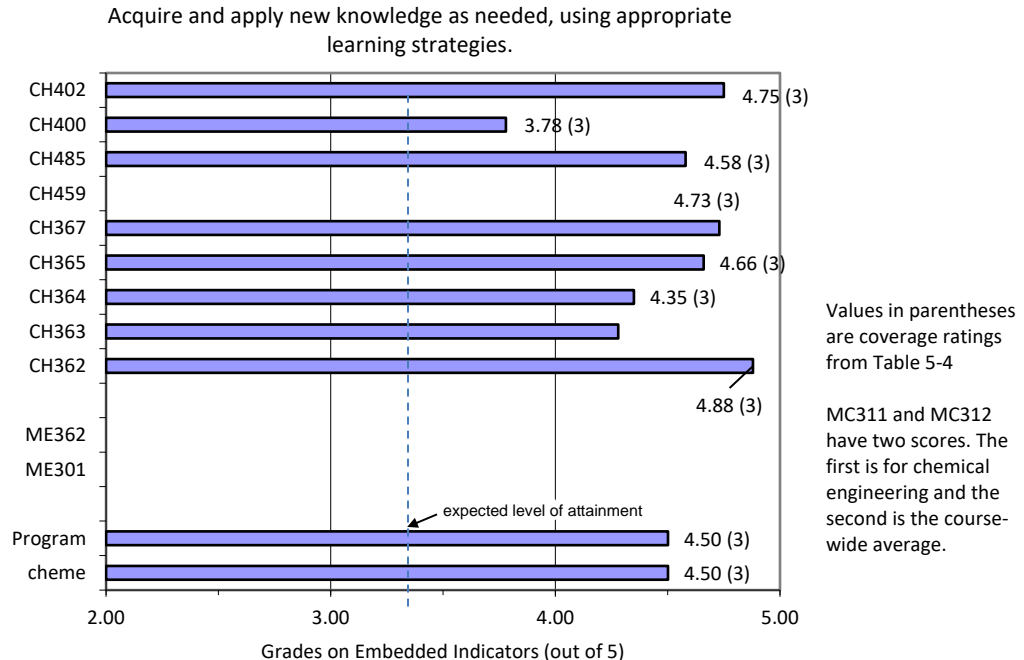


Figure 7-1. Coursework Embedded Indicator results for Student Outcome 7.

2. Percent of Eligible Cadets taking the Fundamentals of Engineering Examination (FEE). For the Class of 2024, 19 of 19 chemical engineering cadets (100% of eligible cadets) prepared for and took the FEE. For the Class of 2023, 13 of 13 chemical engineering cadets (100% of eligible cadets) prepared for and took the FEE. This compares to 100% in years 2018 and 2019, with 31% in 2020 (9 of 29), and 100% in 2021, 2022, and 2023. The decline in participation in 2020 was due to closure of NCEES test centers nationwide in addition to restrictions on cadet movement during the COVID-19 crisis. NCEES reported a decline from 1047 participants in 2019 to 480 in 2020, which recovered somewhat to 668 in 2021, 600 in 2022, 521 in 2023, and 654 in 2024. **Note: The participation rate is EXCELLENT.**

### 3. End of Semester Student Surveys

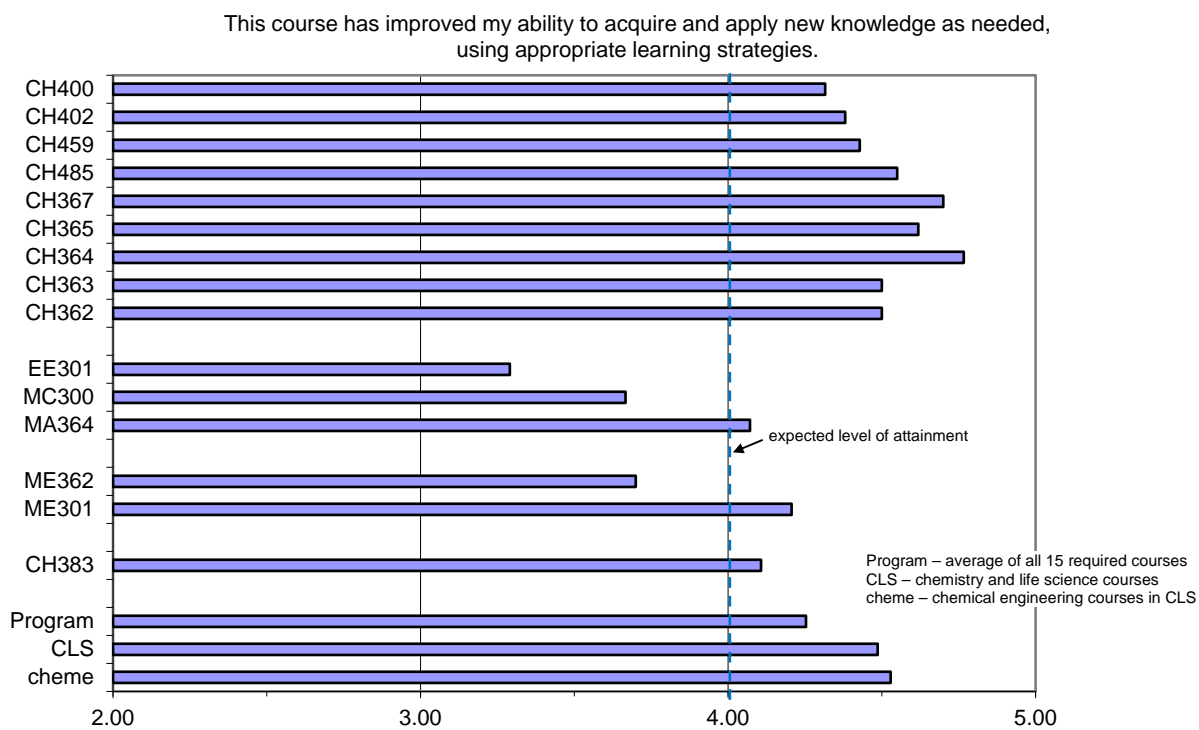


Figure 7-2. End-of-Semester Student Survey responses for Student Outcome 7.

4. Chemical Engineering Program Exit Survey. As stated earlier, this survey is given to the Firsties at the end of their last semester. In this question, they were asked whether they agree with the statement “The program has prepared me to Acquire and apply new knowledge as needed, using appropriate learning strategies.” 21 out of 21 cadets completed the survey, including 1 studies cadet and one class of 2025 (turnback). Of these, 21 out of 21 cadets said that they either agreed or strongly agreed (score = 5/5 or 4/5), with 14/21 replying that they strongly agreed (score = 5/5) and 7/14 replying that they agreed (score = 4/5). This equates to a mean score of  $4.62/5.00 \pm 0.50$  for the 21 cadets. The expected level of attainment on this survey is 4.00/5.00.
5. Lifelong Learning Skills Rubric. This rubric, when used in tandem with the resume writing assignment in CH365, is designed to assess performance in four skills associated with the ability to acquire new knowledge, namely: rubric row 1 - engagement (in professional activities), rubric row 2 - recognition (of skills learned in the program), rubric row 3 – intellectual growth (recognition of new skills), and rubric row 4 – communication (in resume format). Resumes were written at the beginning of the semester (assignment 1.1), then revised at the end of the semester (assignment 2.1). One rubric is shown for each assignment below, along with cadet averages and standard deviations. The expected levels of attainment are color-coded, with red indicating a need for improvement, yellow indicating acceptable

performance, and green indicating that expectations are met or exceeded. Instructor comments are in the rubrics.

Instructor's Name: <b>Biaglow</b>				Cadet Assessed: <b>Summary, all cadets in CH365</b>			
Your Position: <b>Instructor, CH365</b> (e.g., CD CH365)				Cadet Major: <b>Chemical Engineering</b> (e.g., Chem. Eng.)			
	<b>1 – Needs Improvement</b>	<b>1</b>	<b>2</b>	<b>3 – Meets Expectations</b>	<b>3</b>	<b>4</b>	<b>5 – Exceeds Expectations</b>
<b>Engagement Outcome 7</b>	No evidence of pre-professional activities.			References to pre-professional activities are lacking or connections to chemical engineering are weak or implied.			Uses examples of pre-professional chemical engineering activities.
							<b>5.0 ± 0.0</b>
<b>Recognition Outcome 7</b>	Skills learned in chemical engineering courses taken in previous semesters are not listed.			Skills are listed, but the skills are vaguely described, or connection to chemical engineering concepts is not clear.			Identifies specific skills learned in chemical engineering courses.
							<b>4.6 ± 0.5</b>
<b>Intellectual Growth Outcome 7</b>	Unable to identify new concepts learned this semester.			Changes are apparent in document, but connections to recent activities in chemical engineering are weak or implied.		<b>4.4 ± 0.6</b>	Addition of multiple skills acquired this semester.
<b>Communication Outcome 3</b>	Resume lacks organization or cohesion. Numerous grammatical errors that may interfere with meaning. Target audience unclear.			Occasional grammar errors that do not impede meaning. Demonstrates ability to write a basic resume, but document is uninteresting and flat.			Demonstrates an ability to effectively communicate in the resume format. Clear, concise content. Resume is interesting.
							<b>4.8 ± 0.3</b>
Has this cadet demonstrated SO7 (acquiring knowledge)? (Y/N) <b>Y</b>	Comments: Cadet scores were very good overall because most cadets read the assignment carefully, paid attention to the guidance, and wrote about ideas that met the rubric requirements.  Final Grade: <b>4.7 ± 0.5 / 5.0</b>					Assignment used for assessment: (e.g., resume draft 1.1 in CH365)  <b>resume draft 1.1 in CH365</b>	

Instructor's Name: <b>Biaglow</b>				Cadet Assessed: <b>Summary, all cadets in CH365</b>			
Your Position: <b>Instructor, CH365</b> (e.g., CD CH365)				Cadet Major: <b>Chemical Engineering</b> (e.g., Chem. Eng.)			
	<b>1 – Needs Improvement</b>	<b>1</b>	<b>2</b>	<b>3 – Meets Expectations</b>	<b>3</b>	<b>4</b>	<b>5 – Exceeds Expectations</b>
<b>Engagement Outcome 7</b>	No evidence of pre-professional activities.			References to pre-professional activities are lacking or connections to chemical engineering are weak or implied.			Uses examples of pre-professional chemical engineering activities.
							<b>5.0 ± 0.0</b>
<b>Recognition Outcome 7</b>	Skills learned in chemical engineering courses taken in previous semesters are not listed.			Skills are listed, but the skills are vaguely described, or connection to chemical engineering concepts is not clear.			Identifies specific skills learned in chemical engineering courses.
							<b>4.7 ± 0.5</b>
<b>Intellectual Growth Outcome 7</b>	Unable to identify new concepts learned this semester.			Changes are apparent in document, but connections to recent activities in chemical engineering are weak or implied.		<b>4.4 ± 0.6</b>	Addition of multiple skills acquired this semester.
<b>Communication Outcome 3</b>	Resume lacks organization or cohesion. Numerous grammatical errors that may interfere with meaning. Target audience unclear.			Occasional grammar errors that do not impede meaning. Demonstrates ability to write a basic resume, but document is uninteresting and flat.			Demonstrates an ability to effectively communicate in the resume format. Clear, concise content. Resume is interesting.
							<b>4.8 ± 0.3</b>
Has this cadet demonstrated SO7 (acquiring knowledge)? (Y/N) <b>Y</b>	Comments: Scores increased slightly with respect to the first draft in row two (recognition). Scores were similar to last year. Instructor provided mentoring on inclusion of new content from current chemical engineering courses.  Final Grade: <b>4.7 ± 0.5 / 5.0</b>					Assignment used for assessment: (e.g., resume draft 1.1 in CH365)  <b>resume draft 2.1 in CH365</b>	

There is normally improvement in scores in draft 2.1 as cadets incorporate instructor comments to improve and polish their documents. Version 2.1, though, requires articulation of new skills acquired during the semester. Scores can go down if cadets do not show new activities and skills learned during the current semester, and in some individual cases the scores did drop, and intellectual growth (row3) did increase. Overall and on average, the program scores are solidly in the green in all four categories by the end of the semester.

6. Contemporary Issues Rubric (follows on page 18). The contemporary issues rubric is designed to assess performance in four skills associated with the ability to acquire new knowledge, namely: rubric row 1 - acquiring knowledge (through development and use of references), rubric row 2 - technical competence of the cadet (as demonstrated with writing skills), rubric row 3 – impact of contemporary issues (ability to link contemporary issues to relevant chemical engineering concepts), and rubric row 4 - grammar and structure. Each of these skills, taken independently, are associated with written communication (Student Outcome 3). However, the development and blending of these skills into a coherent and well-crafted essay are a measure of acquisition of new knowledge and are thus used by our program to assess Student Outcome 8. Admittedly, this is not a complete measure of a student's ability to acquire new knowledge, only that ability as expressed in an essay. Therefore, we combine this exercise with the other embedded indicators in this section of the report.

Operationally, the contemporary issues rubric is completed by the instructor to award grades to cadets for the writing assignments in this course. In this case, LTC Cowart used one writing assignment in CH485, completed in two drafts. The draft and final submissions were graded against the rubric, with the total average score and average scores per outcome shown in the screenshots above. In AY24 (this year), the average for the draft was  $4.0 \pm 0.81$  and the average on the final was  $4.8 \pm 0.4$ , so cadets achieved a better average on the final than on the draft submission. Scores also showed some improvement year-to-year, compared to  $3.8 \pm 0.9$  and  $4.8 \pm 0.5$  in AY23 in the draft and final reports, respectively. We conclude that cadets achieved each of the graded rubric rows with proficiency, and instructor comments are included in the screenshots.



Instructor's Name: <b>LTC Cowart</b>				Cadet Assessed: <b>All Cadets in CH485 (AY24-1)</b>				
Your Position: <b>CD, CH485</b> (e.g., CD CH485)				Cadet Major: <b>Chemical Engineering</b> (e.g., Chem. Eng.)				
	<b>1 – Needs Improvement</b>	<b>1</b>	<b>2</b>	<b>3 – Meets Expectations</b>	<b>3</b>	<b>4</b>	<b>5 – Exceeds Expectations</b>	<b>5</b>
<b>Acquiring Knowledge</b> <b>Outcome 7</b>	Cites references but they are not substantive or do not address assignment. Context is weak or implied. Uses generic arguments or lacks specificity.			Cites at least two references relevant to the assignment. References have been adequately studied and re-worded to support a thesis.		4.0 +/- 0.7	Uses multiple substantive examples or scholarly articles in an integrative fashion to support a thesis.	
<b>Technical Competence</b> <b>Outcomes 8</b>	Demonstrates poor or incomplete understanding of technical content.			Demonstrates some knowledge of the technical content, but explanation lacks adequate depth.		3.6 +/- 0.8	Demonstrates exceptional knowledge of technical content.	
<b>Impact of Contemporary Issues</b> <b>Outcome 4</b>	Does not have a premise or does not connect issues in essay to concepts in chemical engineering.			Makes connections to chemical engineering concepts, but the connections are weak or implied or premise is weak.		3.9 +/- 0.7	Makes very clear connections between premise and chemical engineering concepts.	
<b>Communication</b> <b>Outcome 3</b>	Writing lacks organization or cohesion. Numerous grammatical errors or errors interfere with meaning. Thesis lacking or implied.			Occasional grammar errors that do not impede meaning. Demonstrates ability to write an essay but lacks cohesion or completeness. Thesis not fully supported.		4.3 +/- 0.9	Demonstrates an ability to effectively communicate in the essay format. Fully supported, clear, concise thesis. Writing style was exceptionally clear and articulate.	
Has this cadet demonstrated SO7 (acquiring knowledge)? (Y/N) Y	Comments: Cadets met expectations on the draft writing assignment. Cadets demonstrated acquisition of new knowledge and generally wrote in an acceptable format. Technical content with respect to chemical engineering processes, including heat & mass transfer can be improved, as well as writing organization. Final Grade: 4.0 +/- 0.81					Assignment used for assessment: (e.g., draft 1 writing assignment 1 in CH485) CH485 Writing DRAFT		

Instructor's Name: <b>LTC Cowart</b>				Cadet Assessed: <b>All Cadets in CH485 (AY24-1)</b>				
Your Position: <b>CD, CH485</b> (e.g., CD CH485)				Cadet Major: <b>Chemical Engineering</b> (e.g., Chem. Eng.)				
	<b>1 – Needs Improvement</b>	<b>1</b>	<b>2</b>	<b>3 – Meets Expectations</b>	<b>3</b>	<b>4</b>	<b>5 – Exceeds Expectations</b>	<b>5</b>
<b>Acquiring Knowledge</b> <b>Outcome 7</b>	Cites references but they are not substantive or do not address assignment. Context is weak or implied. Uses generic arguments or lacks specificity.			Cites at least two references relevant to the assignment. References have been adequately studied and re-worded to support a thesis.			Uses multiple substantive examples or scholarly articles in an integrative fashion to support a thesis.	4.8 +/- 0.4
<b>Technical Competence</b> <b>Outcomes 8</b>	Demonstrates poor or incomplete understanding of technical content.			Demonstrates some knowledge of the technical content, but explanation lacks adequate depth.			Demonstrates exceptional knowledge of technical content.	4.7 +/- 0.5
<b>Impact of Contemporary Issues</b> <b>Outcome 4</b>	Does not have a premise or does not connect issues in essay to concepts in chemical engineering.			Makes connections to chemical engineering concepts, but the connections are weak or implied or premise is weak.			Makes very clear connections between premise and chemical engineering concepts.	4.8 +/- 0.4
<b>Communication</b> <b>Outcome 3</b>	Writing lacks organization or cohesion. Numerous grammatical errors or errors interfere with meaning. Thesis lacking or implied.			Occasional grammar errors that do not impede meaning. Demonstrates ability to write an essay but lacks cohesion or completeness. Thesis not fully supported.			Demonstrates an ability to effectively communicate in the essay format. Fully supported, clear, concise thesis. Writing style was exceptionally clear and articulate.	4.8 +/- 0.4
Has this cadet demonstrated SO7 (acquiring knowledge)? (Y/N) Y	Comments: Significant improvement from the draft version of the contemporary issues essay. Technical improvement, inclusion of figures/drawings/schematics, coupled with extensive discussion of contemporary issues regarding the chosen topic resulted in interesting, thoughtful papers. Final Grade: 4.8 +/- 0.4					Assignment used for assessment: (e.g., draft 1 writing assignment 1 in CH485) CH485 Writing FINAL		

**Level of Achievement of Student Outcome 8:**

The program provides the graduate with a thorough grounding and working knowledge of the chemical sciences, including:

- (8.1) Chemistry.
- (8.2) Material and energy balances
- (8.3) Safety and environmental factors.
- (8.4) Thermodynamics of physical and chemical equilibria.
- (8.5) Heat, mass, and momentum transfer.
- (8.6) Chemical reaction engineering.
- (8.7) Continuous and staged separation operations.
- (8.8) Process dynamics and control.
- (8.9) Modern experimental and computing techniques.
- (8.10) Process design.

***Assessment Instruments and Frequency:***

1. Fundamentals of Engineering Examination, once/yr.
2. Average Course Grades for Chemical Engineering Students, once/yr.

***Assessment Results:***

1. Fundamentals of Engineering Examination, Table 4-14. For the Class of 2021, the breakdown by topic is shown in comparison to the national averages.

<b>Subject</b>	<b>Outcome</b>	<b>Questions</b>	<b>USMA ChE</b>	<b>National</b> (expected level of attainment)
Chemistry & Biology	8.1	7	10.0	9.6±2.7
Material & Energy Balances	8.2	10	9.1	9.5±2.3
Safety, Health, & Environmental	8.3	5	9.6	10.1±3.3
Thermodynamics	8.4	8	9.2	9.4±2.2
Heat Transfer	8.5	8	8.6	9.8±2.5
Fluid Mechanics/Dynamics	8.5	8	9.2	9.4±2.4
Chemical Reaction Engineering	8.6	7	9.2	9.6±2.3
Mass Transfer & Separations	8.7	8	9.0	9.7±2.3
Process Control	8.8	4	10.0	10.2±3.4
Computational Tools	8.9	0	---	---
Economics	8.10	4	10.6	10.2±3.5
Process Design	8.10	7	9.2	9.8±2.5



2. Course grades for the last six years are shown below, Table 4-4 (from Self Study).

Course ↓		Chemical Engineering Student Outcome 8								
		Advanced Chemistry	Mater. & Energy Bal.	Thermodynamics	Transport	Reaction Engineering	Separations	Dynamics & Control	Experiment & Compute	Process Design
		8.1	8.2	8.4	8.5	8.6	8.7	8.8	8.9	8.10
CH383	Organic Chemistry I	2.53								
CH365	Chem. Eng. Thermo.			3.82						
CH362	Mass & Energy Balances		3.48							
CH363	Separation Processes						3.68			
CH364	Chem. Reaction Eng.					3.54				
CH459	Chem. Eng. Laboratory								3.70	
CH485	Heat and Mass Transfer				3.14					
CH400	Chemical Engineering Sem.									
CH402	Chem. Eng. Process Des.									3.65
MA366	Vector Calculus									
ME301	Thermodynamics			3.46						
ME362	Fluid Mechanics				3.32					
CE300	Fund. Eng. Mech. & Des.									
EE301	Intro. To Elec. Engineering									
CH367	Intr. Auto. Process Control							3.28		
Average Grade 2024		2.53	3.48	3.64	3.23	3.54	3.68	3.28	3.70	3.65
Average Grade 2023		2.64	3.17	3.35	3.21	3.38	3.59	3.51	3.41	3.44
Average Grade 2022		3.15	3.64	3.59	3.47	3.33	3.69	3.42	3.80	3.33
Average Grade 2021		2.78	3.54	3.33	3.23	3.31	3.37	3.35	3.67	3.46
Average Grade 2020		3.06	3.53	3.27	3.20	3.38	3.64	3.36	3.53	3.26
Average Grade 2019		3.14	3.63	3.69	3.39	3.67	3.92	3.51	3.52	3.26
<i>Previous 5-year Running Average</i> (Expected level of attainment)		2.95	3.50	3.45	3.28	3.41	3.64	3.43	3.59	3.35
Standard Deviation 2024		0.76	0.48	0.58	0.52	0.47	0.48	0.67	0.47	0.46

Table 4-2. Faculty Evaluation of Chemical Engineering Student Outcomes

<b>Chemical Engineering Student Outcomes</b>	<b>Faculty Evaluation</b>
On completion of the chemical engineering program, our graduates are able to:	
1. Identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics.	4.67 $\pm$ 0.50
2. Apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors.	4.44 $\pm$ 0.73
3. Communicate effectively with a range of audiences.	4.56 $\pm$ 0.53
4. Recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts.	4.56 $\pm$ 0.73
5. Function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives.	4.89 $\pm$ 0.33
6. Develop and conduct appropriate experimentation, analyze, and interpret data, and use engineering judgment to draw conclusions.	4.56 $\pm$ 0.53
7. Acquire and apply new knowledge as needed, using appropriate learning strategies.	4.56 $\pm$ 0.73
8. Understand the chemical engineering curriculum, including chemistry, material and energy balances, safety and environmental factors, thermodynamics of physical and chemical equilibria, heat, mass, and momentum transfer, chemical reaction engineering, continuous and staged separation processes, process dynamics and control, modern experimental and computing techniques, and process design.	4.67 $\pm$ 0.71
<b>5- Excellent; 4 – Very Good; 3 – Acceptable; 2 – Weak ; 1 – Poor</b>	

Table 4-3. Advisory Board Evaluation of Chemical Engineering Student Outcomes

<b>Chemical Engineering Student Outcomes</b>	<b>Advisory Board's Evaluation</b>
On completion of the chemical engineering program, our graduates are able to:	
1. Identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics.	n/a
2. Apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors.	n/a
3. Communicate effectively with a range of audiences.	n/a
4. Recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts.	n/a
5. Function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives.	n/a
6. Develop and conduct appropriate experimentation, analyze, and interpret data, and use engineering judgment to draw conclusions.	n/a
7. Acquire and apply new knowledge as needed, using appropriate learning strategies.	n/a
8. Understand the chemical engineering curriculum, including chemistry, material and energy balances, safety and environmental factors, thermodynamics of physical and chemical equilibria, heat, mass, and momentum transfer, chemical reaction engineering, continuous and staged separation processes, process dynamics and control, modern experimental and computing techniques, and process design.	n/a
<b>5- Excellent; 4 – Very Good; 3 – Acceptable; 2 – Weak ; 1 – Poor</b>	

Advisory board scores are not available (n/a) until the next advisory board meeting in April 2025 and will be updated at that time.

Table 4-4. Summary of Chemical Engineering Student Outcomes Performance.

Chemical Engineering Student Outcomes	Program Director's Summary
On completion of the chemical engineering program, our graduates are able to:	
1. Identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics.	5
2. Apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors.	5
3. Communicate effectively with a range of audiences.	4
4. Recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts.	5
5. Function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives.	5
6. Develop and conduct appropriate experimentation, analyze, and interpret data, and use engineering judgment to draw conclusions.	5
7. Acquire and apply new knowledge as needed, using appropriate learning strategies.	5
8. Understand the chemical engineering curriculum, including chemistry, material and energy balances, safety and environmental factors, thermodynamics of physical and chemical equilibria, heat, mass, and momentum transfer, chemical reaction engineering, continuous and staged separation processes, process dynamics and control, modern experimental and computing techniques, and process design.	5
5- Excellent; 4 – Very Good; 3 – Acceptable; 2 – Weak ; 1 – Poor	

## 2025 Advisory Board Surveys

Welcome to our annual advisory board meeting. As you know, we consider each of you to be valued shareholders in our program and the meeting is our annual shareholder's meeting, where we show you our performance report and discuss methods of improving the program. This document is your official advisory board survey, and it is *extremely important to our program*. It is designed to do two things. First, the completed surveys provide *documentation* that you have been briefed on the performance of our cadets and the relevance of the program objectives, helping us maintain our accreditation. Second, it allows us to use your collective knowledge and experience to *identify areas* where we might need improvement. The surveys are based in part on the data that we present to you during this meeting, and your responses are your "thumbs up or down" to the various performance indicators we are tracking. This survey is part of the assessment for *Academic Year 2024* (cadets who graduated in May 2024).

### Instructions

- The survey pertains to student outcomes (Part I), program educational objectives (Part II), and program improvement (Part III). You will be given time during the day to answer the questions.
- For Part I, use the data to evaluate the attainment of our student outcomes. You will also meet with cadets, and the opinions you form of them might also influence your ratings. It is completely appropriate to use that information in the formation of your opinions.
- Part II pertains to the relevance, consistency, and cadet awareness of the program educational objectives. Your opinions and our discussions will help shape future revisions of these objectives.
- Part III contains some free-form questions where you can comment on the quality of the curriculum, the meeting itself or any other items you would like us to address.
- The survey is electronically fillable. Use the tab key to step through the form.
- *The surveys are due by the end of the day, 11 April 2025 or as soon as possible.* If you complete the survey after you leave, please email the electronic survey or mail the physical copy to us as soon as possible.

Name: \_\_\_\_\_

Date: \_\_\_\_\_

The mission of the chemical engineering program is to prepare commissioned leaders of character who are proficient in applying chemical and engineering principles to solve problems in a complex operational environment.

**Chemical Engineering Program Objectives (Revised in 2024):** During a career as commissioned officers in the United States Army and beyond, program graduates:

- Demonstrate effective leadership by leveraging chemical engineering expertise and precise technical communication.
- Contribute to the solution of complex problems in a dynamic environment.
- Apply disciplined technical expertise to succeed in advanced study programs.

**Chemical Engineering General Program Outcomes (Outcomes 1-7):** On completion of the chemical engineering program, our graduates demonstrate an ability to:

- Identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics.
- Apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors.
- Communicate effectively with a range of audiences.
- Recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts.
- Function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives.
- Develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions.
- Acquire and apply new knowledge as needed, using appropriate learning strategies.

**Chemical Engineering Curriculum Outcomes (Outcome 8):** The program provides the graduate with a thorough grounding and working knowledge of the chemical sciences, including:

- Chemistry
- Material and energy balances
- Safety and environmental factors
- Thermodynamics of physical and chemical equilibria
- Heat, mass, and momentum transfer
- Chemical reaction engineering
- Continuous and staged separation operations
- Process dynamics and control
- Modern experimental and computing techniques
- Process design

Name: \_\_\_\_\_

Date: \_\_\_\_\_

**Part I. Student Outcomes.** Review the data and then check the box in the column that most closely represents your opinion.

The cadets in the program are able to:	Strongly Disagree	Neutral	Strongly Agree
<ul style="list-style-type: none"> <li>Identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics.</li> </ul>			
<ul style="list-style-type: none"> <li>Apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors.</li> </ul>			
<ul style="list-style-type: none"> <li>Communicate effectively with a range of audiences.</li> </ul>			
<ul style="list-style-type: none"> <li>Recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts.</li> </ul>			
<ul style="list-style-type: none"> <li>Function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives.</li> </ul>			
<ul style="list-style-type: none"> <li>Develop and conduct appropriate experimentation, analyze, and interpret data, and use engineering judgment to draw conclusions.</li> </ul>			
<ul style="list-style-type: none"> <li>Acquire and apply new knowledge as needed, using appropriate learning strategies.</li> </ul>			
<ul style="list-style-type: none"> <li>Have attained a thorough grounding in and working knowledge of the chemical engineering curriculum.</li> </ul>			

Name: \_\_\_\_\_

Date: \_\_\_\_\_

**Part II. Program Objectives.** Check the box that most closely represents your opinion.

	Strongly Disagree	Neutral	Strongly Agree
The program objectives are consistent with the USMA mission.			
The program objectives are consistent with the needs of the Army.			
The program curriculum supports the program objectives.			
The student outcomes are consistent with the program mission and objectives.			
The program has a process for periodically assessing the achievement of its student outcomes.			
The survey methods used by the program are effective.			
The cadets in the program are aware of the program objectives.			
The cadets are given an opportunity to provide their opinion about the program objectives.			
The cadets are satisfied with the courses in the program.			
The faculty are aware of the program objectives.			
The faculty are given an opportunity to provide their opinion about the program objectives.			



Name: \_\_\_\_\_

Date: \_\_\_\_\_

**Part III. Open Questions.** Answer the questions below or provide other input as desired.

Based on the assessment data or on your personal opinion, is there a course that the program should add to the curriculum? Please explain.

Do you have any suggestions to improve the advisory board meeting for next year?

Please add any addition comments that you would like to make below.