DEPARTMENT OF THE ARMY
**UNITED STATES MILITARY ACADEMY**
West Point, New York 10996

**REPLY TO ATTENTION OF**

MADN-CHM-LS

13 September 2016

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MEMORANDUM THRU COL F. John Burpo, Professor and Acting Head, Department of Chemistry and Life Science, United States Military Academy, West Point, NY 10996

FOR Dean of the Academic Board, United States Military Academy, West Point, NY 10996

SUBJECT: 2016 Executive Summary of Chemical Engineering Program Assessment

1. This memorandum is an executive summary, per *DPOM 5-07 Assessment of Student Learning in the Academic Program*, outlining the changes in the Chemical Engineering Program's assessment and assessment process, as well as curriculum changes, that have occurred since the last executive summary in December 2015.

a. The Chemical Engineering Program did not make any changes to or recommendations to change the program during AY16. However, the program provided a revised 8-Term Academic Plan (8TAP) as part of the USMA curriculum changes throughout the academic year. A curriculum change memorandum was submitted during AY16 detailing the relationship between the Chemical Engineering Program and the new core curriculum. The revised 8TAP was ultimately approved by the Dean during the department's R&A briefing in April 2016. The approved 8TAP for the new major (CEN1, beginning with the class of 2019) is shown in Appendix 1. Because of the removal of EN302 and HI301 as core courses, the revised major, CEN1, dropped to 42 ½ courses.

b. Course Student Outcomes (SO) Assessment: The analysis of AY16 SOs proceeds from the chemical engineering program assessment process, which includes analysis of an extensive data pack, discussions among faculty members, advisory board members, and students, as well as survey data capturing the opinions of each of these groups. Assessment data for embedded indicators is included in Appendix 2. The full program assessment data and evaluation results, to include survey data, will be included as an Appendix to this document when complete. The performance of cadets on the Fundamentals of Engineering Exam (FEE) during AY16 was 17/22 (77%) cadets passing, in line with the national chemical engineering average pass rate. Overall, there were no major changes to the attainment of Student Outcomes compared to the previous year (AY15). Some trends and evaluations of note are as follows.

(1) Data for Student Outcome 12 (FE Exam data) show continued relative weak performance in process control (See Appendix 3 for FEE data comparison to previous years). After discussion of this data with the faculty and advisory board, the program has proceeded to introduce a new course focused on chemical engineering process controls (per Paragraph D of this memorandum).

(2) AY16 was the initial follow up assessment for the previous introduction of the CH365 Chemical Engineering Thermodynamics course. This course was introduced to address continual low performance in this topic area on the FEE. Data for AY16 indicates performance this year was almost exactly at the national average, a relative improvement from previous years. Continued assessment will occur in subsequent years.

c. Summary of results of Academic Program Goals and What Graduates Can Do (APG-WGCD) responsibility evaluations conducted during the year.

(1) As part of the curriculum change memorandum (December 2015), a complete mapping of Student Outcomes with the APG-WGCD framework was conducted, and is shown in Appendix 4. There are no updates to this mapping.

(2) No changes to the course responsibilities were recommended for the upcoming academic year. However, course directors for AY16 were reminded during the faculty meeting to consider future adjustments to responsibilities during their course assessments during AY17.

d. Significant planned curricular changes. The Chemical Engineering program is proposing one significant curricular change moving into AY17.

(1) Change description: Add a new course on Automatic Process Control to the CEN1 8TAP. Remove XE472 Dynamic Modeling and Control from the CEN1 8TAP.

(2) Change justification: The Chemical Engineering majors continue to under-perform on the controls portion of the chemical engineering FEE (Appendix 3). Discussion with the Chemical Engineering Advisory Board indicates that process control is receiving much more attention in industry, with topics of particular concern to chemical engineering that are not necessarily relevant to other disciplines. These needs are not currently met by XE472 or by other previous attempts to address the issue (primarily inclusion of a controls section in CH459). Discussion with the XE472 course leadership resulted in the conclusion that offering a separate course for chemical engineers was the best way forward. The proposal is being developed and will be submitted for review during AY17-1.

(3) Approval authority for change: Curriculum and General Committees.

(4) Proposed changes to SOs: No change. The new course will especially help to evaluate SO 12(g).

(5) Timeline for the change: Recommend the change for the Class of 2020, the first iteration being taught during AY19.

(6) Anticipate follow up evaluation in AY20.

e. During AY17, we anticipate proposing changes to the Student Outcomes for the program. These changes will reflect upcoming changes to the ABET evaluation criteria. As the ABET criteria are finalized, we will submit corresponding proposed changes.

f. There are no planned changes to the Chemical Engineering program's assessment process.

g. Current assessment schedule. Program assessment for AY16 will be complete by 30 April 2017 (following our next advisory board meeting) and will be added as an Appendix to this Executive Summary. The planned Advisory Board meeting for AY17 will occur in April 2017 and the AY17 program assessment will be included in the AY17 Executive Summary. The next ABET record year will be AY19-20 with the onsite visit during the fall of 2020.

2. Point of contact for this action is the Chemical Engineering Program Director, LTC Geoffrey Bull, at x2031.

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4 Encls
1. Approved CEN1 8TAP
2. Program Assessment Data AY2015-2016
3. FEE Topical Outcomes Evaluation
4. Student Outcome to APG/WGCD Mapping

GEOFFREY R. BULL
LTC, FA52
Chemical Engineering Program Director

**APPENDIX 1 to 2016 Executive Summary of Chemical Engineering Program Assessment.**
**Approved CEN1 8TAP**

## CEN1 - Class of 2019

| 4th Class Year Fall Term | Spring Term | 3rd Class Year Fall Term | Spring Term | 2nd Class Year Fall Term | Spring Term | 1st Class Year Fall Term | Spring Term |
|---|---|---|---|---|---|---|---|
| *E* **MA103** 4.0 | *E* **MA104** 4.5 | *E* **MA205** 4.5 | *R* **CH362** 3.5 | *R* **EE301** 3.5 | *R* **HI302** 3.0 | *D,R* **CH459** 3.5 | **CH402** 3.0 |
| */D* **EV203/ CH101** 4.0 | *D/R* **CH101/ PH205** 4.0 | *R* **PH205/ PH206** 4.0 | *R/* **EV203/ PH206** 4.0 | *R* **CH363** 3.5 | *R* **CH364** 3.5 | **CH365** 3.0 | **CH400** 1.5 |
| **EN101** 3.0 | **EN102** 3.0 | *R* **CH102** 4 | **MA366** 3.0 | *R* **CH383** 3.5 | **MC312** 3.0 | *R* **CH485** 3.5 | **Engr Elective** 3.0 |
| **IT105** 3.0 | **PL100** 3.0 | *E* **DFL1** 4.0 | **PY201** 3.0 | *D* **MC311** 3.5 | **SS307** 3.5 | **Engr Elective** 3.0 | *D* **LW403** 3.5 |
| **HI105** 3.0 | **HI108** 3.0 | *R* **SS201** 3.5 | *E* **DFL2** 4.0 | **PL300** 3.0 | **XE472** 3.0 | *D* **MC300** 3.0 | **Engr Elective** 3.0 |
| | | **MA206** 3.0 | *R* **SS202** 3.5 | | | | **MX400** 3.0 |

*D = Double blocked course*

*R = RSTU lab course*

*E = Meet every day for 55 minutes*

Course should not be moved from that year or term

Course may be scheduled in the fall or spring of that academic year

Complementary Support Courses

Core Engineering Sequence (not applicable)

Course 3 Science Depth

Course 9 STEM Depth

other electives - most popular electives are templated

## APPENDIX 4 TO 2016 Executive Summary of Chemical Engineering Program Assessment: Student Outcome to APG/WGCD Mapping.

| Student Outcome | Communication | | | | | Critical/Creative Thinking | | | | | | Lifelong Learning | | | | Disciplinary Depth | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1.1 | 1.2 | 1.3 | 1.4 | 1.5 | 2.1 | 2.2 | 2.3 | 2.4 | 2.5 | 2.6 | 3.1 | 3.2 | 3.3 | 3.4 | 7.1 | 7.2 | 7.3 | 7.4 | 7.5 |
| **a** | | | | | | | | | | | | | | | | XX | XX | XX | XX | |
| **b** | | | | | | XX | | | X | | | | | | | XX | | X | | |
| **c** | | | | | | XX | | | | XX | X | | | | | XX | | X | X | |
| **d** | X | | X | | X | XX | XX | | | | | | X | | | | | XX | XX | XX |
| **e** | | | | | X | X | | | | | | | | | | XX | X | X | | |
| **f** | | | | | | | | | | X | | | | | | X | | X | | |
| **g** | XX | XX | XX | | | | | | | | | | | | | X | | | X | X |
| **h** | | | X | | X | | | | | | X | | | | X | | | X | X | X |
| **i** | | | | | | | | | | | | XX | XX | | | | | X | | |
| **j** | | | XX | | X | | | | | | | XX | X | | | XX | X | | | |
| **k** | | | | | | | XX | | | X | | X | X | | | XX | XX | X | | X |
| **Total** | XX | XX | XX | | X | XX | XX | | X | XX | X | XX | XX | | X | XX | XX | XX | XX | XX |

**APPENDIX 1 to 2016 Executive Summary of Chemical Engineering Program Assessment.**
**Approved CEN1 8TAP**

## CEN1 - Class of 2019

| 4th Class Year Fall Term | Spring Term | 3rd Class Year Fall Term | Spring Term | 2nd Class Year Fall Term | Spring Term | 1st Class Year Fall Term | Spring Term |
|---|---|---|---|---|---|---|---|
| *E* **MA103** 4.0 | *E* **MA104** 4.5 | *E* **MA205** 4.5 | *R* **CH362** 3.5 | *R* **EE301** 3.5 | *R* **HI302** 3.0 | *D,R* **CH459** 3.5 | **CH402** 3.0 |
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| **HI105** 3.0 | **HI108** 3.0 | *R* **SS201** 3.5 | *E* **DFL2** 4.0 | **PL300** 3.0 | **XE472** 3.0 | *D* **MC300** 3.0 | **Engr Elective** 3.0 |
| | | **MA206** 3.0 | *R* **SS202** 3.5 | | | | **MX400** 3.0 |

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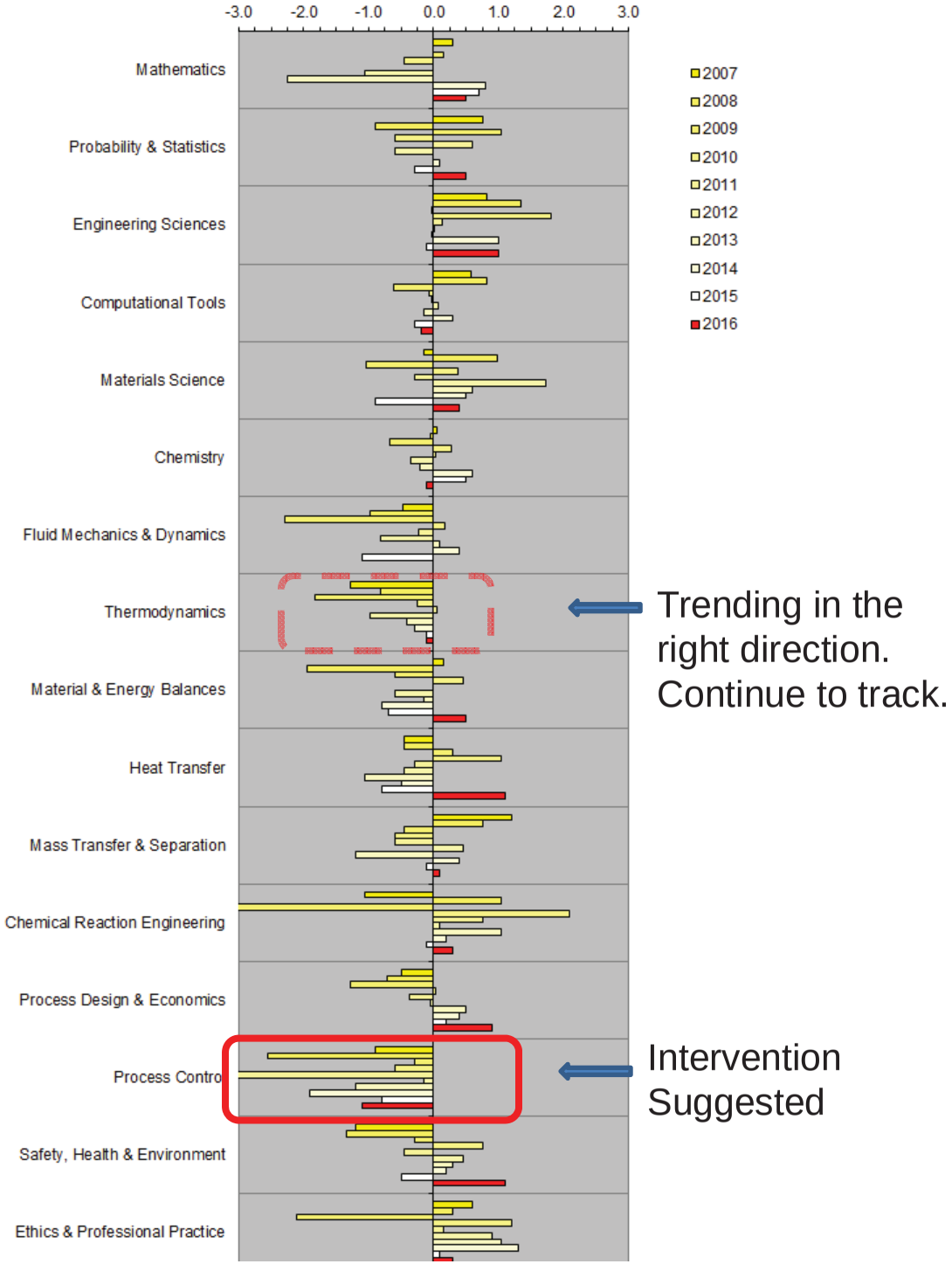
# Topical Outcomes Evaluation

Deviations from National Averages AY07 to AY16



## APPENDIX 4 TO 2016 Executive Summary of Chemical Engineering Program Assessment: Student Outcome to APG/WGCD Mapping.

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| **a** | | | | | | | | | | | | | | | | XX | XX | XX | XX | |
| **b** | | | | | | XX | | | X | | | | | | | XX | | X | | |
| **c** | | | | | | XX | | | | XX | X | | | | | XX | | X | X | |
| **d** | X | | X | | X | XX | XX | | | | | | X | | | | | XX | XX | XX |
| **e** | | | | | X | X | | | | | | | | | | XX | X | X | | |
| **f** | | | | | | | | | | X | | | | | | X | | X | | |
| **g** | XX | XX | XX | | | | | | | | | | | | | X | | | X | X |
| **h** | | | X | | X | | | | | | X | | | | X | | | X | X | X |
| **i** | | | | | | | | | | | | XX | XX | | | | | X | | |
| **j** | | | XX | | X | | | | | | | XX | X | | | XX | X | | | |
| **k** | | | | | | | XX | | | X | | X | X | | | XX | XX | X | | X |
| **Total** | XX | XX | XX | | X | XX | XX | | X | XX | X | XX | XX | | X | XX | XX | XX | XX | XX |