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

MADN-CLS 13 December 2021

MEMORANDUM FOR RECORD

SUBJECT: Chemical Engineering Program Assessment and AAR (AY22-1)

1. The senior faculty of the chemical engineering program at the United States Military Academy met on 13 December 2021 to conduct a post-semester review of courses taught during Fall 2021 and current program assessment. The faculty members in attendance were Dr. Andrew Biaglow, LTC Matthew Armstrong, LTC Sam Cowart, Dr. Enoch Nagelli, and Dr. Simuk Yuk. Chemical engineering faculty members not in attendance were COL Corey James, MAJ Jeff Chin, CPT Caspar Yi, CPT Patrick Bowers, and CPT Galen Mandes.

2. These post-semester discussions serve as a tool to gauge effectiveness of course content and administration in meeting the ABET student outcomes specific to each course. Comments and questions from these discussions support the more formal content of the written course assessment packages that are completed at the end of each academic term. Ideas for course improvement and potential future changes are the focus of the discussions.

3. Each fall term (AY22-1) course was reviewed and thoroughly discussed by all attendees. Key points of discussion focused on the desired scope of major graded events (term-end exams, capstone projects), cadet proficiency with computational software, curriculum focus for CH363 (Separations), and a first review of CH350 (Bioprocess Engineering).

4. The point of contact for this document is the undersigned at samuel.cowart@westpoint.edu or 845-938-5817.

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UNITED STATES MILITARY ACADEMY
WEST POINT

Chemical Engineering

Course and Program AAR

LTC Matthew Armstrong & Dr. Enoch Nagelli

13 December 2021

Agenda

- CH365
- CH459
- CH485
- CH350
- CH363
- Chemical Engineering Program AAR Comments

CH365 AAR

- CDP: Individual problems (molecule, conditions, and mixture specific to cadets) – intense grading but worth it. Positive collaborative experience. CHEMCAD acumen – no change; Cadets used a flash – OK but did not consider compressor and heat exchanger to go from T1,P1 to T2,P2. At end of course 2/23 cadets had wrong thermo method in settings compared to 6/20 in AY21.
- Writing assignment – table and abstract for CDP. Iterative, 1ST was generally poor (some good) but improved with intense feedback from instructor.
- Three CDP IPRs keeps cadets on task, but cadets were generally unable to modify early IPR information. Task was to simulate CHEMCAD in MMA, and cadets continued to report comparison of ideal gas values
- Writing assignment – resumes, also iterative. Provided format, so initial resumes were better. Some cadets unable or unwilling to identify new project skills. Most could not identify skills learned in the program, so this continues to be valuable.
- Performance on exams was strong. Averages on WPRs 88% ± 9% compared to 89% ± 10% in AY21).
- Course assessment incomplete as of 12-9-20. Blackboard surveys 100%. Tracking performance in FEE.
- Course is not complete.

CH459 AAR

- Assigned roles and had cadets rotate roles within each round robin:
  - Project Engineer, Process Engineers, Process Simulation Engineers
- Conducted Daily IPRs – sit down with Project Engineer and feedback provided based on rubric
- Same approach as AY21-1, WPR1 tests round robin 1 material and WPR2 tests round robin 2 material.
- More emphasis on using Visio and Lucidchart to develop P&IDs
- Videos were beneficial for cadets to produce a procedure before coming to class
  - CEF will provide more insight
- Made homework individual assignments
  - Saw cadets within own group not working together on the homework
- Cadets do not read detail on rubrics to execute lab report, EXSUM, and Poster
- Overall weakness in CHEMCAD for this group

CH459 AAR - Roles

No.	Roster Name (CD)		Lab Groups	
CD1	BAILEY, DORIAN		Group CD1 R ,P,E	BAILEY, DORIAN
CD2	BARTRAM, CLARA			O'MALLEY, LIAM
CD3	CURTIN, MACKENZIE			MEINKE, JONATHAN
CD4	KNIGHT, THOMAS			ZAMMIT, ALEXA
CD5	LEE, EVAN		Group CD2 P,E,R	Morris, Jackson
CD6	MEINKE, JONATHAN			Lee, Evan
CD7	MORRIS, JACKSON			Knight, Thomas
CD8	O'MALLEY, LIAM			Waddington, Joseph
CD9	PINCOT, ANDRE		Group CD3 E,R,P	Bartram, Clara
CD10	ROCHA, PAUL			Curtin, Mackenzie
CD11	THOMPSON, CAMERON			Pincot, Andre
CD12	WADDINGTON, JOSEPH			Rocha, Paul
CD13	ZAMMIT, ALEXA			Thompson, Cameron

E = Executive Summary
R = Lab Report
P = Poster

LAB GROUP ROLES (the numbers assigned below are based sequential order of cadet names in each group – top to bottom)

4 Person Group Order/Roles
*Lab Group Team Leader (Project Engineer): 1 - 2 – 3 – 4
Plant Process Engineer (Operator): 4 – 3 – 2 - 1
Plant Process Engineer (Operator): 2 – 1 – 4 - 3
Process Simulation Engineer (Analysis): 3 – 4 – 1 - 2

5 Person Group Order/Roles
*Lab Group Team Leader (Project Engineer): 1 - 2 – 3 – 4 - 5
Plant Process Engineer (Operator): 4 – 5 – 1 – 3 - 2
Plant Process Engineer (Operator): 2 – 1 – 4 – 5 - 3
Plant Process Engineer (Operator): 3 – 4 – 5 – 2 - 1
Process Simulation Engineer (Analysis): 5 – 3 – 2 – 1 - 4

CH485 AAR

- Course average: 86.7% (prior to TEE), AY22-1: 87.3%
- Incorporate more example problems for each lesson (about 60% now)
  - FEE practice problems
  - Problems from other transport texts
- Maintain problem solving days before WPRs/ICPS
- Alter writing assignment to align with program writing plan
  - Historically, 5 paragraph argumentative essay
  - This AY: extension of CH364 writing assignment to in-depth review article
- Make change to in-person labs for Labs 2, 4, 5
  - Easier to visualize abstract concepts
  - Cadet understanding of the situation/problem was increased
  - "Better" than sitting in class and remotely collecting data
- Change Lab 7
  - Currently non-dimensionalization of energy and species balances
  - Evaluation of laminar boundary layers with CFD
  - Case study for application of transport analogies and sizing equipment

CH350 AAR

- Mathematica was primarily utilized to obtain 1) the concentration profile based on Michaelis-Menten (MM) kinetics and 2) stochiometric coefficients of metabolic pathways.
  - Plan to introduce additional modelling problems (especially related to metabolic pathways) to enhance cadets' application skill.

- WPR: Cadet performed worse on the WPR #1 relative to the WPR #2; some of them had a hard time employing MM kinetics correctly on different conditions (with and without the presence of inhibitors).
  - Need to incorporate more example problems for MM kinetics as part of in-class exercise.

- Capstone Project: All cadets performed well on capstone presentation. Most of them connected their findings from the recent trend in bioengineering field to the core contents learned throughout the course.
  - Cadets did read the instructions given in the guidance documentation carefully and reflect these in the written documents.

CH363 AAR

- Sizing of condensers and re-boilers in the capstone. Need to teach it in the class or not include it in the capstone….sizing option in CHEMCHAD; should teach first but not currently part of course content
- Students lack thermo and mass transport acumen when they encounter the topics in the book; leads to a watered-down version of what the book is presenting
- All PS involved 2/3 points made up of similar/analogous problems
- I argue to sustain the following: four big take-aways/blocks from CH363:
  - Single stage flash; xy/Txy; CHEMCAD; associated m. bal.
  - Absorbers/Strippers/McCabe Thiele staging; tray efficiency; with CHEMCAD; op. & eq. line; analogous NTU calculation
  - LLE systems: ternary phase diagram; construction; counter vs. co-current flow; w/ addition of mixer-settlers
  - Distillation (both binary and multicomponent); xy; McCabe Thiele staging; tray efficiency; CHEMCAD: SHOR and TOWR

Chem E Prog AAR

- FEE payment plan changing
- 5 first time failures on FEE last Spring
- MC312…
- CME transitioning to fluid dynamics and heat transfer (separate courses)
- SWE in CH459 beginning: AY23-1
- CH459 labs must be done year-round…Winter/Spring/Summer Training.
- Travel team went to AIChE
- Incorporate 1st time rotators into admin./logistics through 'guest lecture'
- Significant administrative and logistical work required for bioengineering electives in AY22…now underway
- Need help with administrative and logistics of CH300 + CH350; CPTs
- Submit curriculum change memos to add to Redbook