Department of Chemistry and Life Science
United States Military Academy
West Point, New York 10996

MADN-CLS 15 December 2020

MEMORANDUM FOR RECORD

SUBJECT: Chemical Engineering Program Course and Program AARs AY21-1

1. The course assessment meeting for all AY21-1 chemical engineering courses was conducted 15 December 2020. Attendees: Dr. Andrew Biaglow, LTC Matthew Armstrong, LTC Corey James, Enoch Nagelli, MAJ Trevor Corrigan, Dr. Simuck yuk, CPT(P) Jeff Chin, and CPT Caspar Yi. The courses discussed were CH365 Chemical Engineering Thermodynamics, CH459 Chemical Engineering Laboratory, CH485 Heat and Mass Transfer, and CH363 Separation Processes.

2. Each course director presented topics relevant to their specific courses. These topics are outlined in more detail in the individual course assessments. The course director slides coming into the meeting are provided as enclosures.

3. Some of the topics led to broader discussions relevant to the entire program. These included: 1) general communication skills and technical writing abilities, 2) the use of capstone projects to unify a course, 3) problem sets within courses should be reviewed and changed routinely. In particular, the consensus was that the program needs to develop a unified way to improve communication ability within its major, beginning from the very first courses, 4) remote and hybrid model learning was discussed, and 5) 1s and 0s validation for ABET assessment purposes.

4. POC is the undersigned.

Encl

Course and Program AAR Slides

MATTHEW J. ARMSTRONG
LTC, FA52
Chemical Engineering Program Director

UNITED STATES MILITARY ACADEMY
WEST POINT

Chemical Engineering

Course and Program AAR

LTC Matthew Armstrong & Dr. Enoch Nagelli

15 December 2020

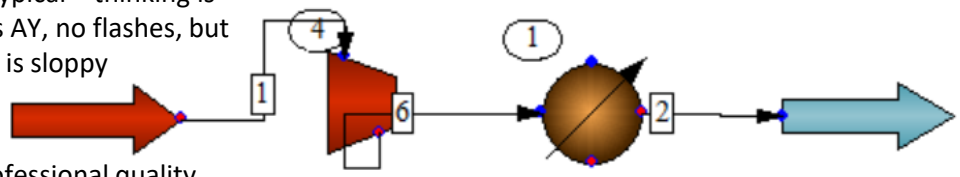
Agenda

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

CH365 AAR

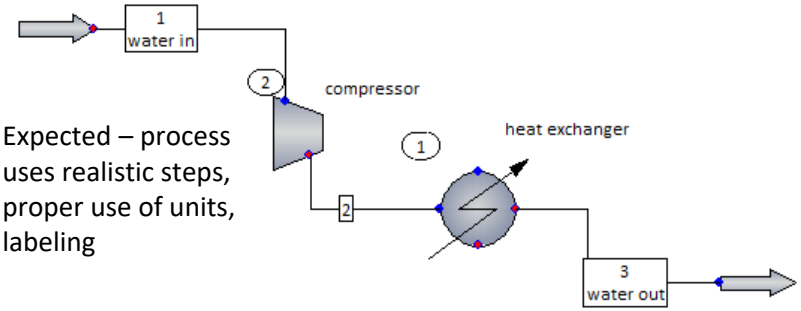
- **CHEMCAD acumen improved; Cadet CDP flowcharts were sloppy (Assignment - design a process to go from T1,P1 to T2,P2)**

Huggins, typical – thinking is better this AY, no flashes, but flow chart is sloppy



Goal – professional quality

Expected – process uses realistic steps, proper use of units, labeling



- **At end of course 6/20 cadets had wrong thermo method in settings compared to 8/29 in AY20.**
- **Writing assignment – table for CDP. Iterative, 1ST was poor but improved with intense feedback from instructor. Added separate com grade.**
- **Writing assignment – resumes. Iterative. Provided format this year, so initial resumes were better. Cadets unable to identify relevant skills, but improved with feedback. Could not remember projects from last AY. Start resumes earlier?**
- **Performance on exams was strong. Averages on WPRs 93% (+5% over AY20).**
- **CDP went well. Individual problems (molecule, conditions, and mixture specific to cadets) – intense grading but worth it. Positive collaborative experience.**
- **Course assessment incomplete as of 12-9-20. Awaiting USMA surveys. Tracking performance in FEE.**

CH459 AAR

- Cadets "self-assemble" into specialists…incorporate responsibilities per lesson and have rotation within each group – better prepare for WPR
- Emphasis on details with connecting theory learned throughout time as ChemE with calculations for each lab
- New HFC did not work at the tail end of Round Robin 1 (software problem)
- Have technician back up plan – coordinate with Lance to have another technician trained on all labs this summer to back up Abhilash in case he is out for long period of time again
- Establish schedule with Abhilash to help calibrate all equipment during spring/summer; run through all labs summer with lab tech…Maintain this!
- Improvements in writing/reports observed due to intense IPR/QA/QC.
- Video are good source to supplement in case remote
- Cadets do not read detail on rubrics to execute lab report, EXSUM, and Poster

CH485 AAR

- Course average: 85.8%
- Incorporate more example problems for each lesson (about 50% now)
- Maintain problem solving days before WPRs/ICPS
- Alter writing assignment to align with program writing plan
  - Currently 5 paragraph argumentative essay
  - Options: review article, executive summary
- Change Lab 3
  - Currently heat exchanger analysis in ChemCAD
  - Change to modeling conduction through various materials in ANSYS Fluent
  - Allows use of different solver; intro to finite volume analysis; allows computational evaluation of thermal conductivity values.
- Change Lab 7
  - Currently non-dimensionalization of energy and species balances
  - Change to evaluation of laminar boundary layers in Fluent
  - Allows determination and comparison of viscous, thermal, diffusion boundary layers.

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
  -to mitigate this MAJ Corrigan provided guest lecture on Chapt. 2-3
- Cadets did not like the hybrid learning model; those remoting struggled
- Re-evaluate problem set problems. Are we using the right ones?
- No TEE due to COVID-19
- I argue for 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

- Many lessons learned from FEE at Education Center/ registration/ etc.
- 2/3 Class of 2020 cadets did not take FEE due to COVID
- CH459 labs must be done year-round…Winter/Spring/Summer Training.
- AIADs canceled last summer due to COVID
- Virtual AIChE Annual Meeting attendance…supported …should maintain this AY21-2.
- Incorporate 1st time rotators into admin./logistics through 'guest lecture'
- Significant administrative and logistical work required for bioengineering electives in AY22
- Need help with administrative and logistics of CH300 + CH350; CPTs