

SUMMARY NOTES

USAFA Civil Engineering Department Industry Visit

13 June 2018 ~ U.S. Air Force Academy
Colonel JOHN A. CHRIST, USAF, PHD, PE, ENV SP
Professor & Head, Department of Civil & Environmental Engineering

Prepared by: Cindy Lincicome, F.SAME

ATTENDEES:

US AIR FORCE ACADEMY

Col John Christ, PhD, PE, Env SP

Lt Col Joel Sloan

Lt Col Robert Young

Maj Kimberly Kays

Maj Adam Strecker

Maj Mark Russel

Capt Jeffrey Schaefer

Dr. Tom Allen

Dr. Stan Radar

SAME/INDUSTRY FIRMS

Col Joe Schwarz, PE, F.SAME (USAF Ret) (HDR)

Ruben Cruz, PE, F.SAME (Merrick & Company)

Greg Merkel, US Forest Service

Cindy Lincicome, F.SAME (Betance Enterprises)

Gary Gaulke (Sigma Metals)

Todd Cartwright, PE

Heidi Brothers (University of Colorado, Denver)

Col David Brewer, PE (USAF, Ret) (Jacobs)

SUMMARY

USAF Academy Department of Civil & Environmental Engineering continues to look for opportunities to improve. This includes engaging with their constituents. They have certainly received feedback from AF Civil Engineers often, and periodically invite former faculty to visit the Department and provide insight on curriculum, resources, and facilities. This year, however, USAFA broadened their aperture just a bit and invited a mix of representatives from the civil engineering industry. For the first time, USAFA reached out to a group identified as contributors to their department and have had a meaningful impact over the years. They felt it likely insightful to update us on their curriculum, resources, facilities, and initiatives to gain our perspective.

During the visit, we talked through the curriculum and initiatives, updates on their facilities, walked through FERL while the cadets were working, and finished with a lunch with their cadet FERL leadership. Discussions ranged from the courses USAFA offers, to strategic partnerships, to future research.

PURPOSE

- Identified what tools, techniques, skills or knowledge the Academy should begin working toward building into their curriculum today to better prepare the Class of 2023 and beyond.
- Not only are these cadets the future engineers and leaders for our Air Force and at our installations, but many will be Industry employees in the next 5-10 years.”
- Recognize that USAFA will meet the projected need of the Air Force. As many of us know, there has been a need to increase the number of pilots and this influenced the number of graduating engineers in 2018.
- Anticipate 44 Civil Engineering graduates in 2019 (32 in 2018)

FUN FACTS & DISCUSSION ITEMS

- Recognize that only 46% of the cadets will serve 20+-year term.
- Many of these cadets will be industry employees. Therefore, USAFA is interested in industry feedback of what will these cadets need to be successful in the A/E/C industry.
- USAFA offers only four electives. Universities offer 12 electives.
- FERL currently underway. This year there are 44 attendees. USAFA has done a very good job in addressing diversity (40% non-majority and 30% women).
- USAFA Program remain traditional, but consider adding other programs that address lifecycle facility management, sustainability, resiliency, safety, etc.
- 80% of incoming cadets express an interest in STEM; USAFA graduates 40%-50% in STEM field.
- USAFA currently offers four design options which include:
 - Forest Service Bridge Design (and then build the bridge on Forest Service property).
Second year for this program.
 - Independent Study (five week session)
 - Research Assignment (must have a 3.0 GPA and be a Civil Engineer major)
 - Theory to Practice (this is a two-part (2 weeks at Air Force Base and then 3 weeks at FERL)

SUMMARY NOTES

USAFA Civil Engineering Department Industry Visit

Page Three

- Many cadets have challenges with the Calculus 3. This has been identified as a hurdle for Civil Engineering Program
- Systems Engineering is the most popular program (does not require Calculus 3; although that will be changing soon)
- Average of 250 cadets (out of the 1000 cadets) are “management” graduates
- Engineering Graduates tend to be (Systems Engineering, Civil Engineering, and Aerospace Engineering)

PATH FORWARD

- Should Air Force consider adding a Construction Engineering Management Program
 - Will this capture some of the Systems Engineering cadets
 - Focus would encompass safety, procurement, management; implement projects in the field, budgets, etc.
- Future Contingency Operations
 - Cadets have the critical thinking required when preparing and working in the environment
- Technology is always changing.
 - What is the skillset that USAFA needs to teach cadets that will transcend their careers vs. teaching a specific software?
- Resiliency continues to be a focus in the Air Force.
 - How does industry define resiliency?
 - How can USAFA incorporate resiliency into their structural engineering program.
- Re-establish a Core CE course (i.e. CE301)

RECOMMENDATIONS FROM GROUP (OPPORTUNITIES FOR FURTHER ENGAGEMENT)

- Emphasize the value for cadets to get their PE
 - Many industry firms require a PE for their engineering positions
 - SAME may be able to better support cadets in preparing for Pes
 - USAFA indicated that the cadets could get permissive leave to take PE after the FE
- Incorporating Resiliency into Programs
 - Major Strecker is an instructor at USAFA and working to develop a resilience program at the Academy
 - Engage Joe D Manous, Jr, PhD, PE, D. WRE (SAME National Resiliency Committee Chairperson) with Major Adam Strecker, to further discussions on resiliency
 - Invite Major Strecker to be a member of the Resiliency Committee to participate in upcoming calls, etc.
- Additional Input from SAME Leaders
 - Cindy to reach out to SAME Leadership to determine if there were other items for USAFA to consider for future program
- Incorporating Resiliency into Programs
- Based on communication with Col Christ, I recommend SAME determine if we can facilitate an IGE with the emphasis on 1-3 topics identified from this meeting.

Follow up from Col Christ

“We certainly appreciated the opportunity to learn from you and found your mix of experience and suggestions very fruitful. Several of the faculty commented on just how valuable they found the discussion. I know you all are very busy. Hence, we greatly appreciate you making time to give back to our program.

We'll certainly follow-up on many of the ideas discussed yesterday. So, expect to hear from Joel, Rob and the team in the coming months on how we might execute on ideas we discussed.

As I mentioned yesterday, we always are looking for opportunities to strengthen our partnerships. So, if you have questions or would like to see other parts of the program during the school year just let us know.”



UNITED STATES
AIR FORCE
ACADEMY



UNITED STATES
AIR FORCE
ACADEMY

USAFA CE Degree Review

Col John Christ
Professor & Head
Department of Civil &
Environmental Engineering

Summer 2018

Civil Engineering Program with Core Curriculum

4°	English 111	Math 141	Comp Sci 110	Foreign Language 1		
	Math 142	Chem 100	Beh Sci 110	Physics 110	Foreign Language 2	
3°	Math 243 Calculus III *	Engr Mech 220	English 211	History 100	Chem or Physics II	
	Math 245 Differential Eqns	Civ Engr 330 Elem Structures	Econ 201	Biology 215	Law 220	
2° summer		Civ Engr 351 – Construction Practices – Field Engineering (OPS CEAF & FERL)				
2°	Civ Engr 361 Hydraulics	Civ Engr 372 Structural Analysis	Civ Engr 390 Soil Mechanics	Engineering Option	ECE 315	Pol Sci 211
	Civ Engr 362 Enviro Engr	Structural Design Option	Engr 311 Power Systems	Aero Engr 315	History 300	Powered Flight
1°	Civ Engr 461 Hydraulic Design	Design Option 1	Basic Science Option	Philos 310	Soc Sci 311	Math 356
	Civ Engr 488 Pavement Design	Civ Engr 480 Proj Mgt & Admn	Design Option 2	Adv. Socioculture	Astro Engr 310	

Key:

Core Required

Core Option

Major's Required

Major's Option

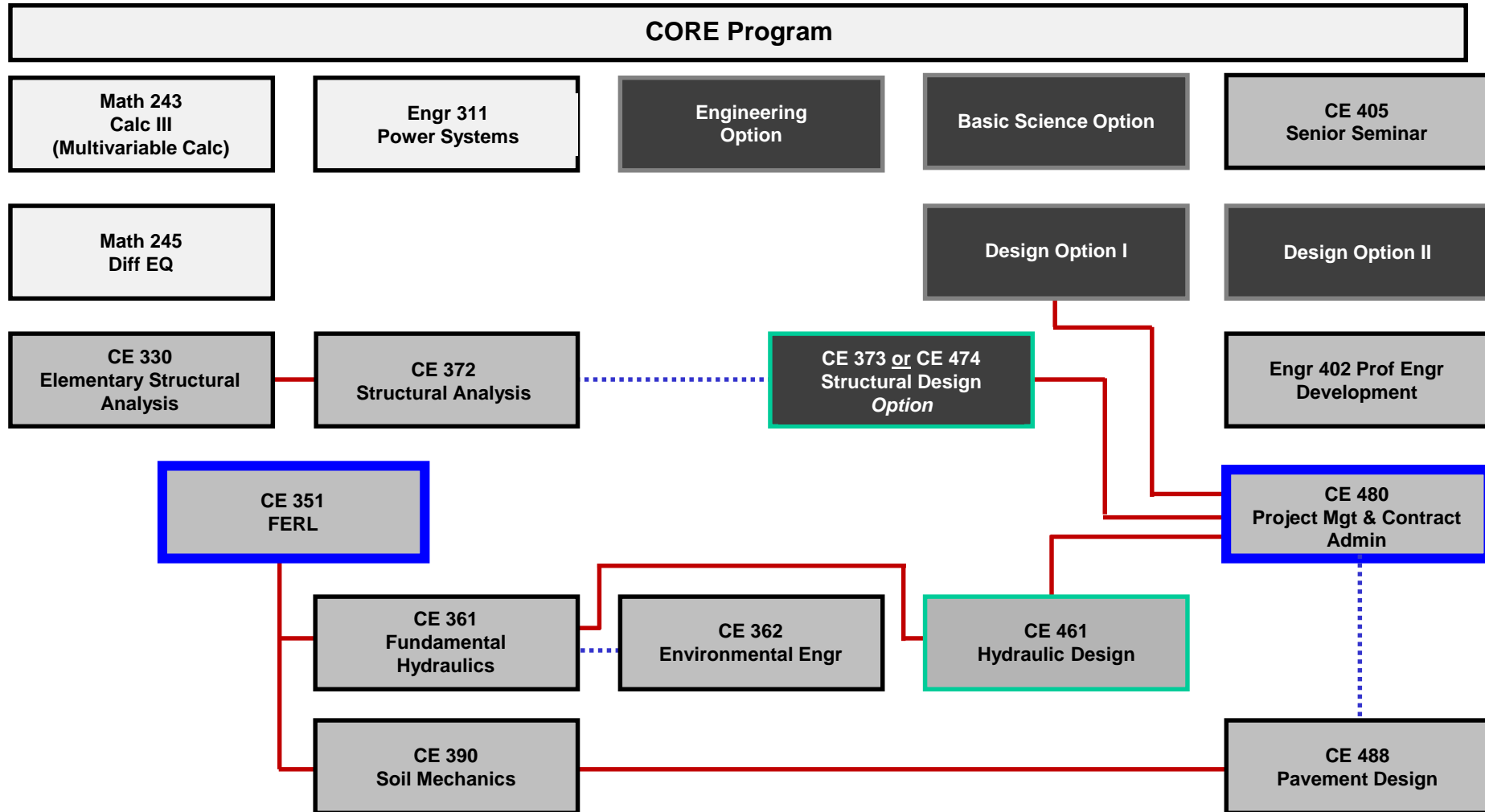
* Course alternatives available

Civil Engineering Program

SOPHOMORE YEAR

JUNIOR YEAR

SENIOR YEAR



— PREREQUISITE

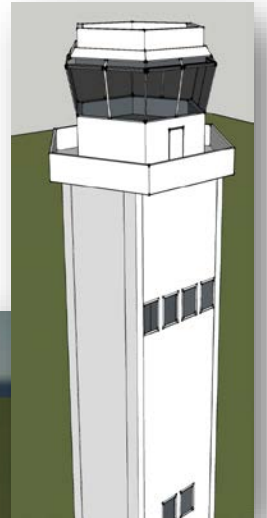
..... COREQUISITE

- Design Options (required to choose 2 of the following courses)
 - Construction
 - CE464 - Architectural Design
 - CE485 - Construction Project Management
 - Environmental
 - CE463 - Wastewater Treatment Plant Design
 - CE467 - Water Treatment Principles and Design
 - Geotechnical
 - CE491 - Foundation Engineering
 - CE492 - Earth Structures
 - Structural
 - CE473 - Structural Design of Multi-Story Building
 - DFCE Engineering Options (1 required from DFCE/other Engr Dept)
 - CE215 - Computer Applications for Civil Engineers
 - CE352 - Lightweight Concrete Design, Analysis and Construction
 - CE365 - Sustainability and Green Engineering
 - CE486 - Applied Construction Practices
 - CE495 - Forest Service Bridge Design
 - CE499 - Independent Study
-

- **CE351 - Civil Engineering Practices - Field Engineering**
 - 1st offering in '94; Program Strength in last two ABET visits ('08 & '14)
- **Two-Part Course**
 - Operation CE/Air Force (OPSCEAF)
 - Field Engineering and Readiness Lab (FERL)
- **Three Primary Focus Areas**
 - Cadet Education
 - Total Force Readiness Training
 - Community Service
- **Recent Enrollment:**
 - ~60 - 75 cadets (ROTC/USMA/USNA)
 - Capacity = 100 cadets
- **Resources**
 - Signed USAFA-A4C support agreement to fund for next 9 years
 - AF continues to support with enlisted/civilian mentors



- CE 480 - Project Management & Contract Administration
- ABET: "Culminating in a major design experience based on earlier coursework"
- Cadets define scope, complete conceptual design, and plan construction of AF project



Course Topics:

Scope Definition

AF Project Avenues

Contract Delivery Methods

Engineering Economics

Sustainable Design

CPM Scheduling

Selecting the Contractor

Managing Design

Cost Estimates

Contract Admin

Contract Types

Change Orders

Dispute Resolution

Engineering Ethics

2017/18 Semester Project:
 Andersen AFB UAS Hangar

2017 "Crucible" Project:
 Cannon AFB Squad Ops

2018 "Crucible" Project:
 Campia Turzii AB, Romania or Powidz, Poland
 Squad Ops Facility

- Maximize FERL
- Increase Reputation
- Undergraduate Scholarship
- Theory to Practice

- Reduced fraction of 32Es from CE major due to increasing pressure to support pilot needs
 - May see an increase in CE enrollment due to Sys Engr changes
- Potential for positive curriculum outcomes
 - Advocating for return to CE core class for all; removed in 2008
 - Examining options for CE-related minors for non-CE cadets; or System Engineering track for CE
 - Considering investigation of adding/re-accrediting majors (e.g., Environmental Engineering, Construction Engineering/mgt)