

# Engineer-Builder to Capstone Instructor

## Challenges and Lessons Learned

Nathan M. Kathir

Department of Mechanical Engineering, Fairfax, VA



### Why Capstone?

- Curricular requirements, 6 credits in senior year
- Meaningful major engineering design experience (ABET 1999-2000)
- Culminating major engineering design experience that 1) incorporates appropriate engineering standards and multiple constraints, and 2) is based on the knowledge and skills acquired in earlier course work (ABET 2021-2022)
- Hands on experience - machine shop
- Teamwork and "final exam"

### Effectiveness of Team Size

Academic Year	2016-17	2017-18	2018-19	2019-20	2020-21	2021-22
Number of Students	19	49	68	59	92	80
Number of Teams	4	10	14	14	17	20
Students per Team	5	5	5	4	5 - 6	4

### Project Sponsors/Funding/Benefits

- Faculty Initiated
- Internal to University
- External non-profits
- Engineering Companies
- Government Agencies
- Future: Student Initiated
- Others ?
- Full spectrum
- Well-defined or Ill-defined
- Project management
- Soft Skills
- Networking
- Capstone Day
- Published in Brochure / Annual Report

### Conclusions and Lessons Learned

#### Conclusions

- Our capstone program, in its sixth year, enriched the students in teamwork, collaboration, project management and communication skills by providing real-world experience
- Graduates are well-prepared to enter engineering practice
- Ideal team size is four; certain projects with high complexity needs five. Teams with six were ineffective.
- Multidisciplinary projects further enhanced student experiences

#### Opportunities

- Mentor future engineers
- Share extensive engineering experience
- Teach program and project management
- Create networking and employment opportunities for students
- Serve the community
- Self-satisfaction

#### Challenges

- Stay refreshed
- Use of Technology
- Sponsor expectations
- Manage unexpected conditions, e.g. pandemic
- Lead by example, be a role model
- Deal with personal issues

### Advising - Student Feedback

#### Advising Model

- Instructors
- Other full-time faculty from Mechanical Engineering
- Faculty from other departments
- Adjunct faculty
- Sponsors
- Postdocs

#### Student Feedback

- Quality of faculty advising varies
- Sponsor involvement varies
- Certain projects more difficult/additional areas
- Multidisciplinary projects needed more coordination and dealt with student dynamics issues

### Students and Teams



### Capstone Day - May 5, 2022

