

“Why do I need this?”

**Is Mathematics
becoming increasingly an
alibi-subject?**

Status quo - students

- Math-anxiety
- Very scarce and often (partially) wrong initial knowledge (some vague and misleading remembrances)
- Many don't attend the bridging courses
- Don't see why they need math
 - At least in first year – basics, which are detached from the rest of the curriculum
- Would need to invest much more time – not available

Status quo - students

- Lack of trust in the curriculum
 - →no trust in the math instructors
 - Maybe we should take their feeling seriously?
- “Why do I need this?”
 - Not enough convincing testimonials available
 - The anti-testimonials predominate
 - Maybe they are right?
- No real engineering attitude – “I really want to know how this works!”
- Forget quickly – no (curricular) built up possible
 - Bulimic learning
 - XA or other methods could be a possibility but need a lot of resources

Status quo – instructors (me)

- Attitude from school continues in year 1
 - Teacher is the “enemy”
 - Even if you make every effort not to be – it’s not up to you
- Love the subject
- Strong intrinsic involvement – interesting at any level

Problem: students think they must show the same engagement for this supporting subject

Would it be better if math was taught by people from their main subject (engineers, computer scientists, biologists, economists, etc.)?

Status quo – instructors (me)

- Depend on their teaching in other departments
- Have to balance between
 - Own criteria established in the field (math comm. of practice)
 - Expectations from other departments (e.g. mathematics should not be a major obstacle in the curriculum)
 - Students expectations and evaluations
- Authority has to be accompanied by strong support/backing from the involved departments
 - This might clash with student feedback
 - Authority vs. hierarchy
- If problems: blame the teacher (didactics should improve)

Status quo – other departments

- Include individual math courses in curricula
 - Why?
 - Tradition ... alibi?
 - Importance?
 - History of the relation between math and engineering
- Some dare to eliminate dedicated math courses and include the necessary mathematics into non-math courses
- Do other departments really need math departments (even applied math) for their curricular programs?
- Real Applied Math is much too difficult

Status quo – other departments

- Scientific work (with respect to students)
 - Often restricted to using the appropriate statistical methods
 - Can this statistical part (BSc and some MSc) be taken over by AI (including the interpretation)?
 - R is available
 - Using R is quite mechanical – could be delegated to AI
 - Why do I need the formulas of density functions?
 - Do I need a mathematician to teach the difference between mean and median?
 - Students will only have to do the non-mathematical part linked to their core study subject.
- Who decides on assessment criteria?
- Are NO-GOs allowed?

Status quo – industry

- They don't state the
 - math content they need
 - math skills they need
 - Math vs. math skills
- Most often the slogan “*problem solving skills*” is used.
 - Is this directly related to math?
 - If yes, should we then completely change math courses from aiming at PDEs to a more content-independent problem-solving centered approach?
 - techniques, structuring, variations, different proofs of the same statement or different solutions to the same problem,...
- Siemens – Turbine department
 - Out of 25 engineers 24 do CAx and only one knows the PDEs
 - Black Boxes issue
- Self-image of the modern engineer

Industry - testimonials

https://www.reddit.com/r/EngineeringStudents/comments/16sdkm3/do_you_really_use_the_math_you_learned_once_you/

Calculus is needed to understand the physics behind the problems engineers solve. If you can wrap your head around the concepts and carry that into your engineering classes it may actually help further understanding of how/why engineers approach things the way they do. Though, in your actual engineering classes the crazy integrals and partial differentials usually get derived into plug and play formulae so if you can grind out the calc courses you'll be fine.

That being said, a lot of us just turn into Excel jockies when we're in industry.

Industry - testimonials

When it does come up, I explain how the magic works and eyes gloss over, jaws drop, nobody gives a shit and absolutely nobody remembers during my performance review. (The points are for tasks completed, not difficulty)

But that's why I get the cool, un-sexy, non-promotion earning mathematically complex assignments.

So yes, you will have opportunities to use it all and become a Math Wizard but it won't necessarily benefit your career if nobody in a position to affect your compensation knows what a partial derivative or an activation function is.

Industry - testimonials

- Greatly depends on what you end up doing, but for most jobs, no. For example, during my tool design internship it was all geometry and basic algebra.
- Depends on ur job. I'm a IE. I will never use calc I II III, DFQ, linear alg. Only basic algebra but even then you can just look it up online

own testimonial

- My own son – I still haven't found time to explain fourier analysis/synthesis to him, but he is going on in synthesizing valuable music without knowing what “really” happens in the black box, which would give him additional possibilities to play with, but he is quite happy with the situation now.

Prepares for an sound-engineering entrance exam.

I'm curious if they will be taught the underlying math, to what extend and by whom...

Thank you!