

Math, in many ways, is a language. The more words you know, the more things you can say. Here are some of the areas of study that use the words of calculus (among others) in their sentences:

Newtonian Physics

Concepts like motion, force, momentum, energy, etc., are best described using Calculus. In fact, Newton originally invented calculus specifically to describe these sorts of things. These laws of physics are the main pillar that modern engineering rests upon.

- Googlewords: Newton's laws of motion, gravity, stress and strain, friction, etc.
- Majors: Physics, Mechanical Engineering, Aerospace Engineering, Civil Engineering, etc.

Circuits & Electricity

All the basic components in electric circuits are described by simple equations using Calculus. In addition, there are fundamental equations that relate electricity and magnetism, which are (slightly less simple) equations using Calculus.

- Googlewords: Capacitor, Inductor, Maxwell's Equations
- Majors: Physics, Electrical Engineering

Fluid Flow

From ocean's currents, to weather patterns and air currents, to water running through plumbing pipes, can all be modeled using simple Calculus equations. Though these equations are similar to the ones for electricity, force, and gravity, we know a lot less about fluids.

- Googlewords: Euler's Equations, Navier-Stokes Equation
- Majors: Aerospace Engineering, Meteorology/Climate Studies, Chemical Engineering

Quantum Physics

Quantum Physics describes the smallest particles we can observe. It is one of our best theories about the understanding of the universe, and it is the theoretical basis for atom bombs and quantum computers.

- Googlewords: Schrodinger's Equation, momentum operator, Uncertainty Principle
- Physics, Electrical Engineering, Nuclear Engineering

Signal Processing

What do noise-canceling headphones, the reception chip on your phone, and the EQ on a soundtrack have in common? They're all waves—in this case either sound or light waves. One key step in wave processing separates high frequencies from low ones, and this step is very much Calculus-based.

- Googlewords: Fourier Transform, Fast Fourier Transform
- Majors: Electrical Engineering

Statistical Analysis

Statistics helps us to understand what's true and false in the real world—but it's also easy to be misleading. Recently, major issues with false science based on bad statistics have been uncovered. On the other hand, pundits and politicians have used bad statistics to justify their opinions for ages. Calculus is helpful for understanding statistics after you get past the intro level.

- Googlewords: linear regression, reproducibility crisis
- Finance, Chem/Bio/Lab Science, Politics, Computer Science

Machine Learning

Neural Networks power the infrastructure of a lot of new technology, including your YouTube recommendation lists, autopilot software for self-driving cars, and facial recognition software. Though they can be quite complicated, most Neural Networks are using a simple Calculus minimization problem as their main algorithm.

- Googlewords: Gradient Descent, Stochastic Gradient Descent, Neural Network
- Majors: Computer Science, Data Science, Statistics, Applied Math

Design a Calculus that doesn't suck

Though Calculus does a good job at expressing things in Science and Engineering, there are a bunch of problems that make it annoying to accomplish specific theoretical tasks.

Mathematicians have come up with a nicer language that doesn't have these problems, which is widely used in Mathematics, Quantum Physics, and Probability Theory

- Googlewords: Dirac Delta, Lebesgue Integral, Measure Theory
- Majors: Pure Math, Theoretical Physics, Theoretical Computer Science

Some other things that I don't understand at all (let me know if you do!)

- Heat Transfer
- Reaction Kinetics
- Mass Transfer
- Control Theory