

# What is Systems Engineering

Dina Sharifi

BSES freshman

ENGS271-B

September 01, 2025

## What is Systems Engineering

In today's world, it is very easy to fall into the trap of becoming overly specialised—programmers focus solely on coding languages, physicists on the laws of physics, psychologists on theories of the mind, and so on. While depth is important, what we often overlook is that as humans, and as future professionals, it is crucial to expand our knowledge across different fields of study. A STEM major can gain insight from the humanities, just as a humanities major can benefit from science and engineering. This broader perspective not only makes us more well-rounded individuals, but also allows us to understand our chosen discipline more deeply: why it exists, what conditions shaped it, and what role our profession plays in the larger system we call "our world".

I labeled our world a system, but what does a system represent? We could define systems as collections of elements—interrelated and interdependent—that work together to satisfy a common purpose. In order for a system to function properly, its components must be organised and structured so that they influence each other as needed. A system is only as efficient as the interactions among its components. There is a wide variety of what we could call a system: the human body, the solar system, a car, the internet, operating systems...

When we refer to "systems engineering", we are talking about certain complex types of systems: Technical systems (e.g. automotive or energy systems), Software systems (e.g. operating system, cloud infrastructure), Organisational systems (e.g. air traffic control, healthcare networks). All these systems have one common trait: they are composed of multiple interacting parts, requiring careful oversight to ensure optimal performance. This is where a systems engineer is needed.

A systems engineer is responsible for managing a system from conception to realisation. Their role covers designing, implementing, and maintaining complex infrastructure, analysing its performance, and enhancing it over time. This involves observing processes, collecting data, and making decisions to optimise individual components, thereby enhancing the efficiency of the system as a whole.

Systems engineers begin by choosing the appropriate hardware and integrating it into existing systems, which requires a comprehensive understanding of hardware, software, and system architecture. They then ensure smooth operation, and address problems to maintain efficiency.

Automation is another crucial responsibility, achieved through tools or scripts that make repetitive tasks happen automatically. This can positively impact time efficiency while also reducing the risk of errors. Monitoring the system is equally important. For this, systems engineers use specialised tools to track performance, detect potential problems early and carry out regular maintenance and updates to ensure safety and reliability.

We could define a systems engineer as a great problem-solver, who possesses not only a wide variety of technical skills (system design, cloud computing, system integration, disaster recovery planning), but also soft skills (communication, critical thinking, time management, adaptability).

To conclusively understand systems engineering, we can revisit the three questions posed in the introduction:

1. What conditions shaped systems engineering? The growing complexity of projects and technology, the need for reliability and safety, and the interdisciplinary nature of modern systems created a demand for professionals capable of managing entire systems rather than individual components.

2. Why does it exist? Systems engineering exists to better manage the complexity of modern, interconnected projects. By equipping professionals to manage multiple technical, human, and organisational elements, it ensures that complex systems function safely, reliably, and efficiently.

3. What role does it have? Systems engineers integrate all available components to create safe and efficient systems. Systems engineering connects engineers, software developers, operators and managers in order to solve real-world problems. This reinforces the main point of the introduction: to be effective members of society, we must embrace interdisciplinary learning, and use that knowledge to design smarter, safer, and more productive systems for the world.