GST 42 – Why General Systems Theory?

Formal Description

General Systems Theory (GST) is the study of the principles that are common to organised systems across many different disciplines. Rather than focusing on the specialised knowledge of any one field, it seeks to identify the concepts and patterns that recur throughout physical, biological, engineered and social systems. By providing a common conceptual framework and language, General Systems Theory supports communication between disciplines and enables knowledge developed in one domain to inform understanding in others.

Plain English Explanation

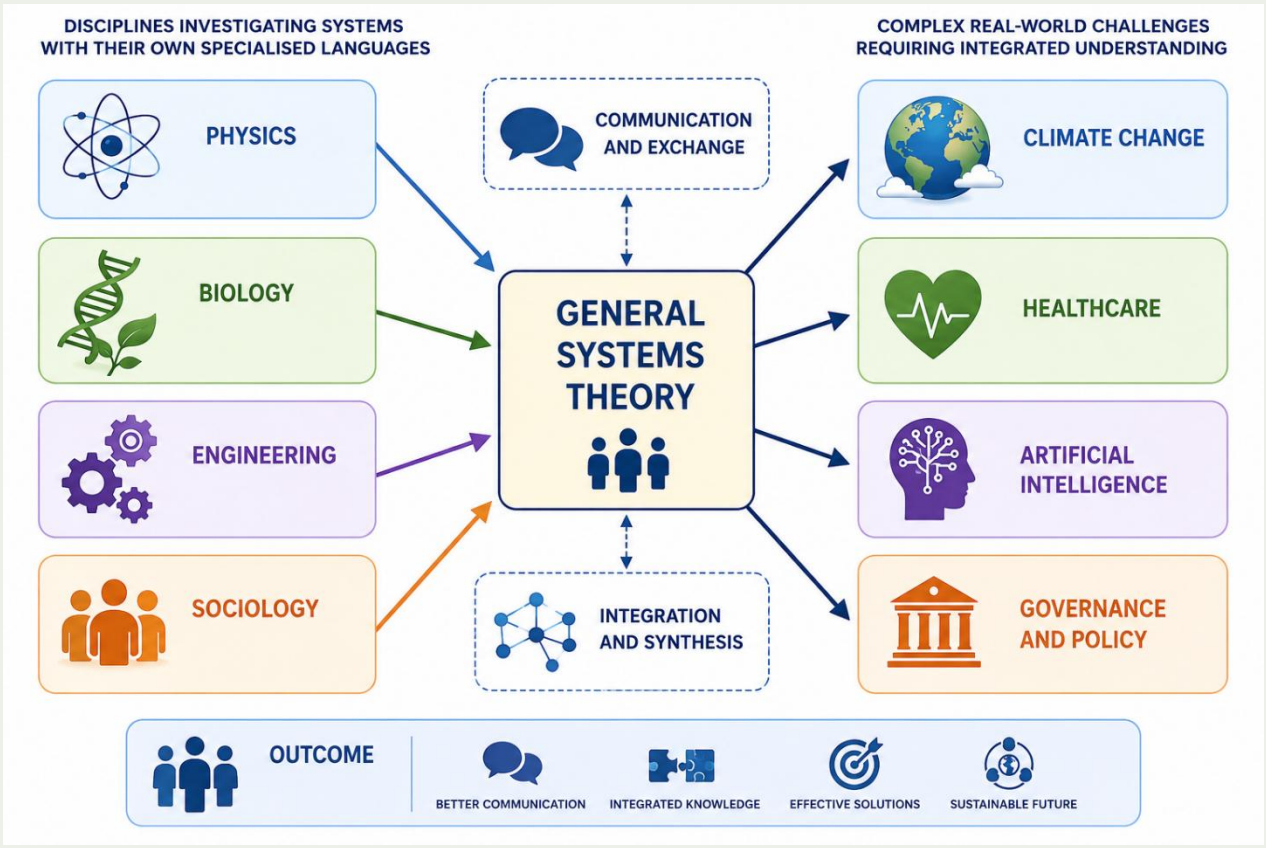
Modern society depends upon many specialist disciplines. Physicists study matter and energy, biologists study living organisms, engineers design technological systems, economists investigate markets, and sociologists study human societies. Each discipline has developed its own language, methods and ways of explaining the world. This specialisation has greatly increased human knowledge, but it has also made communication between disciplines increasingly difficult.

Many of the ideas used by these disciplines are, however, remarkably similar. They all investigate organised entities, examine how those entities interact, observe how they change over time, and seek to understand how they continue to function. Although the terminology may differ, many of the underlying concepts are shared.

General Systems Theory was developed to study these common principles. It does not attempt to replace specialist disciplines or reduce them to a single science. Instead, it provides a common conceptual framework that allows ideas developed in different fields to be compared, related and productively coordinated.

This common framework is becoming increasingly important because many of today's most significant challenges cannot be understood from the perspective of a single discipline. Climate change, healthcare, artificial intelligence, resilient infrastructure, economic development and effective governance all involve complex interactions between physical, biological, technological and social systems. Understanding such problems requires the ability to relate knowledge from many different fields.

The purpose of this course is to introduce the foundational concepts of General Systems Theory. These concepts provide a common language for describing organised reality and establish the basis for studying more advanced topics such as causality, emergence, constraints, feedback and systems dynamics.



Examples

A civil engineer designing a flood alleviation scheme must understand not only hydraulics but also ecology, economics, planning law, environmental policy and human behaviour. General Systems Theory provides concepts that help relate these different forms of knowledge without replacing the specialist expertise of each discipline.

Similarly, improving a national healthcare system requires contributions from medicine, psychology, management, economics, engineering and sociology. Each discipline contributes a different perspective, but all investigate organised systems that interact, change and influence one another. General Systems Theory provides a common framework for bringing these perspectives together.

Provenance and Links

The search for principles common to many different sciences became particularly prominent during the middle of the twentieth century. Ludwig von Bertalanffy is widely recognised as one of the founders of General Systems Theory through his work on open systems and biological organisation. Kenneth Boulding demonstrated how systems concepts apply across different levels of organisation, while W. Ross Ashby made fundamental contributions through cybernetics and the study of regulation. Later contributors, including Peter Checkland, Russell Ackoff, Stafford Beer and many others, extended systems science into management, engineering and the social sciences.

This module adopts the view that General Systems Theory provides a common conceptual framework that complements rather than replaces specialist disciplines. It also distinguishes

between the organisation of reality itself and the representations used by observers to investigate it, reflecting the Critical Realist tradition developed by Roy Bhaskar.

Practical Exercise

Choose a complex problem that interests you, such as climate change, healthcare, urban transport, artificial intelligence, water management or the organisation in which you work.

Write approximately 200 words explaining why knowledge from more than one discipline is needed to understand or improve this problem. Identify at least three different disciplines that could contribute and describe, in general terms, what each would bring to the investigation.