

ADVANCED GRADUATE CERTIFICATE PROGRAM IN COMPLEX SYSTEMS SCIENCE AND ENGINEERING

WHAT ARE COMPLEX SYSTEMS?

Complex systems are networks of many components with nonlinear interactions which arise and evolve through self-organization. These properties are found in many real-world systems, such as political organizations, human cultures/ languages, national and international economy, stock markets, the Internet, social networks, global climate, food webs, brains, physiological systems, and even down to gene regulatory networks in a single cell.

In those systems, critically important information resides in the relationships between components, not necessarily within each component alone. It is imperative to construct a model of how interactions form and operate in order to understand what will emerge at a macroscopic scale.

The recognition of this fact departs from traditional “reductionist” approaches where people try to understand a system by break it into parts. A plethora of concepts and phenomena have been recently discovered

for which such traditional approaches simply don’t work, including nonlinear dynamics and chaos, feedbacks and self-reference, pattern formation, evolution and adaptation, agent interaction in games, collective behavior and phase transition, and complex network topologies. They are now recognized as fundamental concepts and applied in many other disciplines beyond physical sciences, ranging from philosophy and social sciences to biology and engineering.

WHY SHOULD I GET AN ADVANCED CERTIFICATE?

Complex Systems Science and Engineering is a rapidly advancing field of research that investigates structural and dynamical properties of systems to obtain general, cross-disciplinary implications and applications.

The concepts and methodologies apply to various real-world areas including systems engineering, organization management, data analysis, marketing, finance, economics, medicine and healthcare, environmental management, defense, art and education.

There are demands for personnel that have a solid understanding of complex systems and technical capabilities to model, analyze and manipulate them.

A Certificate in Complex Systems Science and Engineering will enhance your expertise in the eyes of employers. The certificate is a strong endorsement for your technical knowledge, skills, intellectual activity and interdisciplinary perspective.

The program also serves as a gateway to STEM-interdisciplinary areas for those from the humanities or other non-STEM disciplines.

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