

# Understand and analyse complex systems

## Critical Systems Thinking



Certificate of Competence

Learn to look at things from multiple perspectives: your own and others', and challenge your mental models

### WHY?

- Manage the complexity within organisations, society and the environment more effectively
- Systems thinking is an essential future-fit leadership skill
- Shift from a reactive to a proactive mindset, approaching situations from multiple perspectives, disciplines and skills

Acquire the ability to define a system within its environment, applying systems thinking tools and techniques to address its complexities. Determine the root causes, and through synthesis, create feasible solutions. Discover methodologies and tools to address the complexities of our transforming society.

### Aimed at

- Business professionals responsible for identifying problems and designing solutions from holistic perspectives
- Managers and decision-makers responsible for allocating resources and making strategic decisions in complex organisations
- Policymakers and public officials who must consider the impact of their decisions on complex systems such as the environment, healthcare and the economy
- Anyone who interacts with complex systems on a regular basis and is interested in understanding how systems work to make more informed decisions, solve complex problems more effectively, and identify opportunities for improvement and innovation



**Duration:** 11 weeks of online learning with final assessment due in week 13

# IMAGINE

Understanding how systems work and the factors that influence behaviour, allowing you to make more informed decisions, solve complex problems more effectively, and identify opportunities for innovation and improvement.

## Learning outcomes

- Define a system within its context
- Realise that all systems have a lifecycle
- Understand the world from a system's perspective
- Apply systems thinking techniques to address complex situations
- Recognise the evolution of systems within an enterprise
- Determine the cause of a situation, and through synthesis, create a solution
- Relate the key principles and methods of systems thinking to your professional challenges

The course aims to assist in a more holistic perception of situations, whether complex, 'wicked', or simple, by adopting a collaborative systems-based approach, and by seeing people as part of the system

# Critical Systems Thinking: Course Prospectus

## Format

Wits University Certified Online Short Course

## Breakdown

11 weeks online learning, and final assessment due in week 13

## Language

English

## Course Outcomes (Summarised)

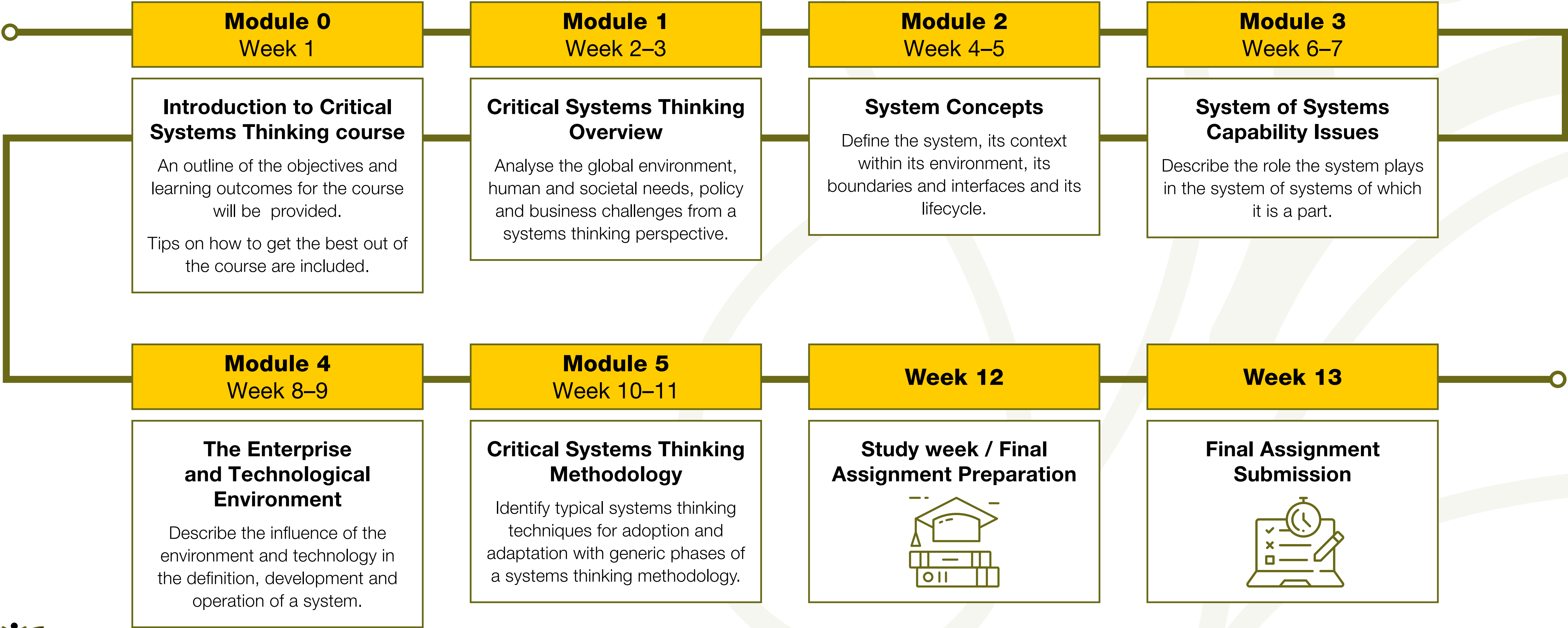
- Define a system, its context within its environment, its boundaries and interfaces, and its lifecycle
- Apply systems thinking tools and techniques to address complex situations in your own environment
- Recognise the evolution of systems within an enterprise and its technological environment
- Determine the root cause(s) of a situation, and through synthesis, create feasible solutions
- Develop an awareness of the role a system plays in a system of systems and appreciate the interaction between the system and its environment

## Course Curriculum

Module 1	Critical Systems Thinking Overview
Module 2	System Concepts
Module 3	System of Systems Capability Issues
Module 4	The Enterprise and Technological Environment Management
Module 5	Critical Systems Thinking Methodology Selection

# Critical Systems Thinking: Course Prospectus

## Course Outline



# Critical Systems Thinking: Course Prospectus

## Course and Module Overview

### Course Overview

Critical Systems Thinking provides a framework to apply systems thinking methodologies and models, considering new and existing situations and approaching these from multiple perspectives, disciplines and skills. This course aims to assist learners to look at situations - whether complex, 'wicked' or simple - more holistically by adopting a collaborative approach on how to view systems, and by seeing people as part of the system.

### Module 1: Critical Systems Thinking Overview

Module 1 introduces the concept of systems thinking to help develop the right mindset for exploring and understanding real problems and opportunities in an increasingly complex world.

- **Topic 1:** Systems thinking – the challenge
- **Topic 2:** Understanding systems
- **Topic 3:** System stakeholders

### Module 2: System Concepts

In Module 2, the characteristics, lifecycle and purpose of systems are described. The module also defines the boundary of a “System of Interest” and the interfaces that exist within the greater environment.

- **Topic 1:** System lifecycle
- **Topic 2:** Hierarchy of Systems
- **Topic 3:** System context
- **Topic 4:** Human System Interface (HSI)

# Critical Systems Thinking: Course Prospectus

## Course and Module Overview

### Module 3 System of Systems Capability Issues

This module introduces the concept of capability and explores the characteristics of a “System of Systems” and the roles thereof. The development of requirements and the modelling of the system will also be addressed.

- **Topic 1:** Concept of capability
- **Topic 2:** System of Systems capability
- **Topic 3:** Translating capability needs to system requirements

### Module 4: The Enterprise and Technological Environment

Module 4 considers the need for systems to be defined and developed within an enterprise and technological context. These contexts impact the lifecycle of the system and place requirements and constraints on the system being developed. The effectiveness and value of a system is determined by how well it considers environmental constraints.

- **Topic 1:** Enterprise influence on definition and development of the system
- **Topic 2:** The influence of technology on definition and development of the system
- **Topic 3:** System influence on technologies

### Module 5: Critical Systems Thinking Methodology

In Module 5, typical systems thinking techniques are unpacked to enable the adoption and adaptation of the generic phases of a systems thinking methodology. This is to ensure suitable holistic and creative alternatives are generated when considering how to significantly contribute to improving situational performance.

- **Topic 1:** Generic phases of a systems thinking methodology
- **Topic 2:** Real-world situation analysis (Finding Out)
- **Topic 3:** Real-world situation modelling, verification, validation and implementation

# Content Experts and Lecturers

## Letlotlo Phohole

### MSc in Technology and Innovation Management

Letlotlo is a results-driven executive with many years' of experience across a variety of industries: De Beers (mining), Transnet (transport logistics), the Council for Scientific and Industrial Research (CSIR), a government funding agency (Technology Innovation Agency), and academia (Wits University). His application of critical systems thinking has allowed him to focus on the integration of various socio-technical disciplines as a coherent and effective system, and to solve 'wicked' problems.

## Nicolas Cloete-Hopkins

### MSc in Systems Engineering Management from University College London

### Bachelor of Commerce from the University of Cape Town

Nic is a Systems Thinking and Engineering specialist with over 23 years' professional experience bridging industry and academia in Africa, the UK, Europe and Indonesia.

## Paul Bester

Paul Bester is a professional engineer (Pr Eng) with programme management, systems and logistic engineering, transportation systems and asset management experience. Paul's 40 years' industry experience include the management of various business units, project portfolio management, and consulting services.



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