**Mathematical Optimization for Business Problems**

**Course Overview**

This course provided an in-depth understanding of **Mathematical Optimization** techniques and their application in solving real-world **business problems**. It covered the foundations of **Operations Research**, **Linear Programming (LP)**, **Integer Programming**, and **Network Optimization**, along with hands-on experience using **CPLEX Optimizer**.

**📌 Key Topics Covered**

1. **Introduction to Optimization**
   * What is optimization?
   * Real-world applications in business and industry
2. **Linear Programming (LP)**
   * Formulating LP problems
   * Objective functions, constraints, feasible regions
   * Graphical and simplex method approaches
3. **Integer and Mixed-Integer Programming**
   * Binary variables and logical constraints
   * Branch and Bound method
   * Investment planning and scheduling problems
4. **Network Optimization**
   * Shortest path, flow, and transportation models
   * Formulating constraints for networks
   * Use of flow conservation rules
5. **Model Formulation and Solvers**
   * Translating business scenarios into optimization models
   * Solving models using **IBM CPLEX**
   * Understanding dual prices, infeasibility, and sensitivity
6. **Best Practices in Optimization Modeling**
   * Hard vs soft constraints
   * Data sparsity and memory efficiency
   * Using piecewise linear approximation

**🛠️ Tools & Technologies Used**

* **IBM CPLEX Optimization Studio**
* **OPL (Optimization Programming Language)**
* **Mathematical modeling techniques**
* **Simplilearn Virtual Lab Environment**

**🎯 Learning Outcomes**

* Ability to define objective functions and model constraints.
* Proficiency in formulating and solving LP and MIP problems.
* Skill to interpret optimization results for better decision-making.
* Practical experience with real-life business case studies and scenarios.