



## Applications of Optimization and Technology in Value Chain

### Objectives

This module aims at developing the following competences:

1. Apply various optimization techniques to solve practical problems for the local community
2. Recommend digital technology for automated data-driven used in the real-world optimization models
3. Work with people in different functional areas as a team to solve the real-world optimization models toward the benefit of common goals.

### Learning Outcomes

Upon the completion of this module, the trainees will be able to:

1. Show understanding of how to apply modeling concepts and mathematical optimization to obtain globally optimal solutions for small-size problems
2. Show understanding of how to apply meta-heuristic techniques to obtain good solutions for large- scale practical problems
3. Show understanding of how to write and execute the mathematical optimization model using professional optimization software
4. Develop mathematical models for real-world problems
5. Utilize appropriate optimization techniques
6. Appreciate the use of digital technology for automated data-driven used in the real-world optimization models
7. Participate actively in a group activity during training
8. Appreciate working with other people in different functional areas

**Prerequisite:** Operations Research

### Outline:

- **Modeling concepts and mathematical optimization**
  - Mathematical notations
  - Linear Programming, Integer Programming, and Mixed Integer Programming formulations
  - An example of an optimization problem with different mathematical formulations
  - Writing and executing the mathematical optimization model using professional optimization software
  - Interpretation of the results obtained from professional optimization software
  - Mathematical Modelling and Real-World Applications
- **Meta-heuristic techniques**
  - Constructive heuristics: Concepts and its applications



- Meta-heuristic optimization techniques (Genetic Algorithm (GA), Differential Evolution (DE), and Particle Swarm Optimization (PSO)) and illustrative applications of constructive heuristics, GA, DE, and PSO techniques
- Utilizing appropriate optimization techniques
- Illustrative applications for solving the real-world problem using a mathematical model, constructive heuristics, and GA, DE, and PSO techniques
- **Use of digital technology for automated data-driven used in the real-world optimization models**
  - Introduction to digital technologies for automated data-driven used in the real-world optimization models
  - Illustrations of the uses of digital technology for automated data-driven used in the real-world
  - Introduction of Ice Transportation and Chambermaid allocation and scheduling software optimization models
  - Illustration of how to design digital technology for automated data-driven used in the real-world optimization models
  - Introduction of Ice Transportation and Chambermaid allocation and scheduling software

#### **Learning Activities:**

- Short lectures
- Group work
- Workshop
- Group discussion
- Group presentation

#### **Time Distribution and Study Load:**

- Training: 15hours
- Coaching: 30 hours
- Group project: 60 hours

#### **Assessments:**

- Exam
- Class discussion and participation
- Presentations
- A pre-test and a post-test of workshops
- Group project

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