

# Operation Research

MEM 124

**Semester: Second**

**Credit Hour: 3**

## **General Objectives;**

- \* Impart knowledge on the concept and methodologies of Operations research.
- \* Visualize and practice mathematical modeling; formulation and problem solving techniques.

## **Specific Objectives;**

Specific objectives of this unit are;

- \* to make the student know about the importance and applicability of data management,
- \* to familiarize the students about the forecasting,
- \* to explain different methods of problem solving techniques for optimal results,
- \* to make the students understand risk in making decisions,
- \* to give the idea of simulation,
- \* to involve students in practicing the formulation of mathematical models and problem solving techniques such as forecasting, queuing, inventory, and optimization problems.

## **Course Contents:**

### **Unit 1: Introduction to Modeling for Decisions**

**3 hrs**

Application and benefits of Operations Research, Developing Models, Analyzing and Solving Models, Interpretation and Use of Model Results

### **Unit 2: Data Management and Analysis**

**6 hrs**

Applications of Data Management and Analysis, Data Storage and Retrieval, Data Visualization Data Analysis, Regression Analysis

### **Unit 3: Forecasting**

**6 hrs**

Models for Time-series with Trend Components, Models for Time-series with Seasonal Components, Models for Time-series with Trend and Seasonal Components, Selecting the Best Forecasting Method, Forecasting with CB Predictor.

### **Unit 4: Introduction to Optimization**

**9 hrs**

Linear and Multi-objective Optimization Models, Modeling Optimization Problems in EXCEL Building Linear Programming Models, Solving Linear Programming Models, Interpreting Solver Results and Sensitivity Analysis, Solving Multi-objective Models, Using Premium Solver for Linear Programming.

### **Unit 5: Decision and Risk Analysis**

**6 hrs**

Application of Decision and Risk Analysis, Structuring Decision Problems, Understanding Risk in Making Decisions, Expected Value decision-making, Optimal Expected Value Decision Strategies

**Unit 6: Monte Carlo Simulation****9 hrs**

Applications of Monte Carlo Simulation, Building Monte Carlo Simulation Models, Different Probability Distributions, Building Simulation Models with CRYSTAL BALL, Optimization and Simulation, Use of OPTQUEST and CRYSTAL BALL.

**Unit 7: Systems Modeling and Simulations****6 hrs**

Application of Dynamic System Models, Queueing Systems, Modeling and Simulating Dynamic Inventory Models.

**References:**

1. Camm, Jeffrey D. and James R. Evans, "Management Science & Decision Technology", South – Western College Publishing, A Division of Thompson Learning, USA, 2000.
2. Ragsdale, Cliff T., "Spreadsheet Modeling and Decision Analysis, A Practical Introduction to Management Science", Course Technology Inc., A Division of International Thompson Publishing, Inc., 1995.
3. Hillier, Frederick S., Mark S. Hillier, and Gerald J. Lieberman, "Introduction to Management Science: A Modeling and Case Studies Approach with Spreadsheets", McGraw-Hill International Editions, 2000
4. Evans, James R. and David L. Olson, "Introduction to Simulation and Risk Analysis", Prentice Hall, Upper Saddle River, New Jersey 07458, 1998
5. Winston, Wayne L., "Operations Research: Applications and Algorithms", International Thompson Publishing, 1994
6. Ravindran, A., Don T. Phillips, and James J. Solberg, "Operations Research and Practice", Second Edition, John Wiley & Sons, 2000