

# Welcome to Management Science!

## Management Science

### Course Description

Management Science is an interdisciplinary field that applies scientific methods to organizational problem-solving and decision-making. By leveraging mathematical modeling, statistics, and numerical algorithms, management science helps businesses achieve their strategic goals effectively.

In this course, you'll build a comprehensive toolkit by solving real problems across diverse business domains. Each algorithm is a tool, each case is a client, and each presentation is a pitch. Throughout the semester, you'll work with realistic, business-relevant scenarios using Python. The course ends in a consulting competition where teams tackle client briefs (food delivery routing, healthcare staff scheduling, or inventory optimization) and present solutions to a panel of "executives."

### Learning Outcomes

By the end of this course, you will be able to:

Technical Skills:

- Implement Management Science solutions in Python
- Work effectively with NumPy and Pandas for analysis and modeling
- Apply Monte Carlo simulation to model uncertainty and risk
- Build and evaluate forecasting models for demand and time series
- Design and analyze scheduling solutions with key performance metrics
- Solve routing problems using heuristics and local search improvements
- Handle multi-objective trade-offs and combine decision criteria meaningfully
- Understand and apply metaheuristics for complex optimization problems

Professional Skills:

- Collaborate effectively in small teams (3-4 students)
- Communicate technical insights with clear visualizations and compelling narratives
- Present solutions in a consulting-style format to business stakeholders
- Approach complex problems with structured analytical thinking

#### Note

This course is specifically designed for business students. No prior programming experience required, the teaching format supports different skill levels so every student can progress effectively.

## Course Structure

The course is organized into three distinct parts across 12 lectures:

- Part I: Python Foundation (Lectures 1-3)
- Part II: Management Science Tools (Lectures 4-9)
- Part III: Consulting Competition (Lectures 10-12)

## Grading

- Assignment 1: Risk & Forecasting (Due Lecture 8) - 30%
- Assignment 2: Full Optimization Toolkit (Due Lecture 10) - 30%
- Final Competition: Client Project (Lectures 10-12) - 40%

### Tip

- Win mini-competitions during lectures (Lectures 4-9)
- Best client project in Part III chosen by peer teams

## Resources & Support

### Required Tools

- Laptop capable of running Python and Jupyter notebooks
- Python (installed via uv package manager in class)
- GitHub Copilot (free with Student Developer Pack)
- VS Code or similar IDE

### Getting Help

1. During class: Ask questions immediately, others likely have the same question
2. Team support: Leverage your group for collaborative problem-solving
3. Email: Response within 48 hours for urgent questions

## AI Policy

Level 1: Pause – Use of AI defined by the educator

A course chatbot is available on the learning website for exploratory study. It is designed to guide your problem-solving process rather than provide answers directly. Use it as a learning tool, not a solution generator.

You may also use external AI tools (e.g., ChatGPT, Claude, Mistral, Gemini). However:

1. Please be careful and try to understand the code generated.
2. Relying on AI to solve tasks for you weakens your own learning.
3. AI should ideally support understanding — not replace practice.
4. Using AI without understanding the code can lead to security risks.

## How to Navigate This Course

- Slides: Click “RevealJS” in the top right corner of each lecture page
- Notebooks: Interactive exercises accompany each lecture

You can find detailed information about course policies, grading rubrics, and expectations in the [syllabus](#).

## Questions & Contact

If you have any questions regarding the course, please contact me at [vlcek@beyondsimulations.com](mailto:vlcek@beyondsimulations.com).

## Contributors

Thanks to [Asvin Goel](#), who inspired part of this course.

## Bibliography