Quantitative Management

Have you ever wondered how business questions such as the following are answered: What is the cheapest method (or route) to transport new vehicles from different harbours to car dealerships? Which payroll should a company purchase if the systems on offer differ with respect to price, customer support and ease of use? How can the quality of service of a manufactured product be measured? How many tellers should operate in a bank to keep the customers happy?

Quantitative management involves the use of mathematical models to solve problems such as those mentioned above in order to support and make better management decisions. Computers are used to find solutions to these models, and these solutions are verified and then applied to the original problems.  The techniques can be applied in a wide variety of management areas, e.g. quality control, forecasting demand, inventory management, production management, and scheduling of resources and personnel.

# Career opportunities

Our graduates work in (among other fields) finance companies, production plants and factories, stores, logistics companies, government departments or parastatals (such as the Department of Water Affairs and Forestry, or Transnet subsidiaries). Good training in quantitative management will enable a person in a management position to analyse and manage a company’s operational functions and processes and quantitatively justify decisions using a combination of managerial and analytical skills.

# Undergraduate subjects offered

Quantitative Management is presented at second- and third-year level and can be followed as a major subject in most BComm programmes.

### 2nd year:

**Quantitative Management 214 (16 Credits)**

Networks: definition, development and testing of quantitative models. Optimisation of network models (minimum spanning tree, shortest and longest routes, maximum flow and minimum cost network flow problems).

Project scheduling (PERT and CPM). Introduction to routing (travelling salesman and Chinese postman problems). Location of facilities (median problems, centre problems and problems with restrictions). Problem-solving with applicable software.

**Quantitative Management 244 (16 Credits)**

Introduction to Optimisation and Modelling: Linear programming (revision, graphical methods, simplex algorithm, duality and sensitivity). Modelling with linear programming. Transportation (modelling, transportation-simplex algorithm).

Deterministic inventory control (ABC analysis, economic order quantity, quantity discounts, non-zero lead time, continuous production models, back orders). Problem-solving with applicable software.

### 3rd year:

**Quantitative Management 318 (24 Credits)**

Optimisation: Integer programming (modelling of 0-1, integer and mixed integer problems, branch-and-bound method). Non-linear programming problems. Assignment and transshipment problems. Goal programming. Dynamic programming (formulation and solution using networks).

Decision theory: Decision analysis (basic concepts, risk and uncertainty, multi-criterion decision analysis, break-even analysis, marginal analysis, decision trees, utility theory, sensitivity analysis). Game theory. Financial and economic investment planning (principles of interest calculation, nominal and effective interest rates, evaluation methods and selection measures, replacement decisions). Decision trees and linear programming models in financial decision theory.

**Quantitative Management 348 (24 Credits)**

Production modelling: Introduction to forecasting (revision of the methods of Holt and Winter, and linear regression). Computer applications of forecasting. Quality control (central limit theorem, confidence intervals, control charts). Applications in the manufacturing and service sectors. Production scheduling. Supply chain coordination, MRP, JIT. Problem-solving with applicable software.

Stochastic modelling: Markov analysis (states, matrix of transition probabilities, equilibrium conditions). Queuing theory (modelling of arrival and service processes, birth-death processes, single and multiple service points, finite population, constant service times). Simulation (random numbers, Monte Carlo simulation, discrete event simulation, analysis of simulation output). Simulation of inventory and queuing models. Applications with spreadsheets and simul8.

*Please consult the official Economic and Management Sciences Yearbook for more information regarding subject combinations and requirements.*