



MATH38041 - 2007/2008

General Information

- Title: Quality Control and Forecasting
- Unit code: MATH38041
- Credits: 10
- Prerequisites: MATH10401, MATH20801
- Co-requisite units: None
- School responsible: Mathematics
- Members of staff responsible: Prof. [Tata Subba Rao](#)

Specification

Aims

To present various standard acceptance sampling plans, quality control methods for monitoring the quality of manufactured items, time series methods for the modelling of data and forecasting using these models.

Brief Description of the unit

Modern quality control has evolved from a purely statistically based sampling procedure to a toolkit of techniques widely used under quality assurance (QA). Statistical Process Control (SPC) and Total Quality Management (TQM) are largely concerned with trouble shooting and early detection of abnormal process operation. The modern quality specialist requires a broad knowledge of the operation of such procedures. Forecasting is an important part of general management; and time series models are often used for forecasting. A brief description of the methods and techniques will be given.

Learning Outcomes

On successful completion of this course unit students will be able to

- design single and double sampling plans with optimum properties;
- construct quality control limits and assess their merits;
- fit simple time series models to real data and calculate forecasts and their standard errors.

Future topics requiring this course unit

None

Syllabus

1. Basic concepts of acceptance sampling; operating characteristic function (OC), producer's risk and consumer's risk. Average run length. [2]
2. Sampling plans (single and double) based on attributes. Rectifying sampling plans. Average outgoing limit (AOQL). Design of a single sampling plan. [4]
3. Sequential sampling plans. Sequential probability ratio tests. Average sampling number (ASN). [4]
4. Principles and objects of control charts. Assignable and random causes of variation. Shewhart's control charts for defectives, defects, means and variances. Average run length (ARL). [4]
5. Cumulative sum control chart. Johnson's approach. Efficiency of Cusum charts. [4]
6. Trend and seasonality in time series. Second order stationarity. Conditions for stationarity and invertibility of time series models. Discussion of AR, MA, ARMA and ARIMA models. Mean square error forecasts. Calculation of forecasts from the time series models. [6]

Textbooks

- J Banks, *Principles of Quality Control*, Wiley 1989.
- C Chatfield, *The Analysis of Time Series: Theory and Practice*, Chapman & Hall 1996.

- D C Montgomery, *Statistical Quality Control*, (2nd edition), Wiley 1991.

Teaching and learning methods

Two lectures and one examples class each week. In addition students should expect to spend at least four hours each week on private study for this course unit.

Assessment

Coursework: two hours weighting 20%

End of semester examination: two hours weighting 80%

Arrangements