

Statistical Process Control

MSc: Statistics and Actuarial-Financial Mathematics

Konstantinos Bourazas
kbourazas@aegean.gr

Department of Statistics and Actuarial-Financial Mathematics

February 19, 2026

Course overview

Main topics

- SPC fundamentals and practical workflow (Phase I and Phase II).
- Shewhart charts for variables and attributes (\bar{X} , R , S , p , u).
- Performance metrics and process capability (C_p , C_{pk}).
- EWMA and CUSUM charts for small persistent shifts.
- Introduction to multivariate monitoring (Hotelling T^2) and self-starting ideas.
- Modern extensions: robust/nonparametric and change-point concepts (selective).

Learning outcomes

After the course, students will be able to **select**, **design**, and **apply** appropriate control charts, and **interpret signals** to support real decisions.

Required background, software, and assessment

Required background

- Probability and distributions, estimation and hypothesis testing.
- Basic familiarity with R for computations and plots.

Assessment: paper and case study

- Each student will be assigned a published paper featuring a specific control chart (assigned **6 weeks** before the deadline).
- **Deliverables:**
 - ① A short **presentation** summarising the paper's methodology and results, presented on **May 21**.
 - ② A **case study** (in R): apply the chart to real or realistic data, produce control charts, and draw conclusions.

Recommended references

- Qiu, P. (2014). *Introduction to Statistical Process Control*. CRC Press.
- Montgomery, D. (2018). *Introduction to Statistical Quality Control*. Wiley.