

Discipline Specific Elective (DSE) Course 2c: Statistical Quality Control

Course Title & Code	Credits	Credit Distribution of the Course			Eligibility Criteria	Prerequisite of the course (if any)
		Lecture (45 Hours)	Tutorial (00 Hours)	Practical (30 Hours)		
DSE 2c: Statistical Quality Control	4	3	0	1	NIL	NIL

Course Objectives:

- To introduce the most important field of applied statistics that contributes to quality control in almost all industries.

Course Learning Outcomes: After successful completion of this course, student will be able to:

- Describe the DMAIC process (define, measure, analyze, improve, and control).
- Demonstrate to use the methods of statistical process control and to determine when an out-of-control situation has occurred.
- Design and use Cumulative sum chart, tabular Cumulative sum chart and V-mask schemes for detecting small shifts of the mean from goal conditions.
- Choose an appropriate sampling inspection technique.
- Gain the ability to understand the concept of errors in making inference
- Understand the concept of OC and ARL of control chart.
- Understand the concept of Dodge's continuous sampling inspection plans.

Unit I (11 Hours)

Basic concepts of process monitoring and process control, Generic theory and review of attributes and variable control charts, errors in making inferences from control charts, OC and ARL of control charts.

Unit II (11 Hours)

Moving average and exponentially weighted moving average control chart (EWMA), cumulative sum control chart (CUSUM) using V-mask and decision intervals, economic design of \bar{X} Chart.

Unit III (12 Hours)

Methods and philosophy of statistical process control, process and measurement system capability analysis: process capability ratios, process capability analysis using a control chart, gauge and measurement system capability studies.

Unit IV (11 Hours)

Review of sampling inspection techniques, single sampling plans, double sampling plans, multiple sampling plans, sequential sampling plans and their properties, Dodge's continuous sampling inspection plans for inspection by variables for one-sided and two-sided specifications.

Essential Readings:

1. Levinson, W.A. (2010). *Statistical Process Control for Real-World Applications*, CRC Press.
2. Montgomery, D.C. (2019). *Introduction to Statistical Quality Control*, John Wiley & Sons.
3. Wetherill, G.B. (1977). *Sampling Inspection and Quality Control*, Halsted Press.

Suggested Readings:

1. Biswas, S. (1996). *Statistics of Quality Control, Sampling Inspection and Reliability*, New Age International Publishers.
2. Burr, I.W. (2020). *Statistical Quality Control Methods: 16 (Statistics: A Series of Textbooks and Monographs)*, CRC Press.
3. Dale, B.H., Carol, B., Glen, B.H., Hemant, B.U. (2018). *Total Quality Management*, Pearson.
4. Duncan A.J. (1974). *Quality Control and Industrial Statistics*, Taraporewala & Sons.
5. Grant, E.L. and Leavenworth, R.S. (2017). *Statistical Quality Control*, McGraw Hill.
6. Knoth S. and Schmid W. (2021). *Frontiers in Statistical Quality Control*, Springer.
7. Mittag, H. J., and Rinne, H. (1993). *Statistical Methods of Quality Assurance*, Chapman & Hall.
8. Montgomery, D.C. (2010). *Statistical Quality Control: A Modern Introduction*, John Wiley & Sons.
9. Ott, E.R. (2005). *Process Quality Control: Troubleshooting And Interpretation of Data Standards media*, 4th edition.
10. Wetherill, G.B. Brown, D.W. (1991). *Statistical Process Control Theory and Practice*, Chapman & Hall.

List of Practicals:

1. Control charts for mean and range
2. Control charts for mean and standard deviation
3. Control charts for individual units
4. Lot-by-lot attribute sampling plans
5. Cumulative sum control chart
6. Moving average control chart
7. Exponentially weighted moving average control chart
8. Process capability analysis procedure.