

**Laboratory Quality Systems**  
**Unit II: Quality Assurance and Quality Control**  
**(Weeks 3 - 5)**

**Learning Objectives**

- Understand the use of statistical process control within a laboratory quality system
- Explain the use of quality control procedures in laboratory with an emphasis on ISO accreditation
- Understand the importance of traceability, proficiency testing and uncertainty in producing reliable and defensible results

**Topic # 1 - Statistical Techniques**

**Presentations**

- [Statistical Process Control – Sources of Variability](#) (17 min.) | [PDF](#)
- Statistical Process Control - Histograms and Variable Control Charts [Part 1](#) (15 min.) | [Part 2](#) (18 min.) | [PDF](#)
- [Statistical Process- Diagnostic Tools](#) (15 min.) | [PDF](#)
- [SPC Attribute Control Charts p-chart, np-chart, c-chart](#) (7 min.) | [PDF](#)

**Excel Demonstrations**

How to Guides	Example Files
<a href="#">Descriptive Statistics in Excel Using the Data Analysis Tool - YouTube (Include how to install the Data Analysis Tool)</a> <a href="#">Descriptive Statistics in Excel - Easy Excel Tutorial</a> <a href="#">How to calculate Correlation Coefficient</a>	<a href="#">Descriptive Statistics, Histogram and Cluster Diagram Demonstration Excel File</a>  <a href="#">Excel Demo file for Descriptive Statistics, Histogram and Cluster Diagram (no annotation)</a>
Histograms <a href="#">Histogram in Excel</a>  <a href="#">How To Create A Histogram in Excel (&amp; change the bin size) - Youtube</a>  <a href="#">Create a Histogram with Excel - Youtube</a>	<a href="#">Statistical Process Control Macro: Histogram and Control Charts</a> <i>(Important: <a href="#">How to enable Excel macros</a>)</i>  <a href="#">Instructions for Creating Histogram and Control Charts in Excel</a> <a href="#">Excel File – histogram.xls use for creating histogram</a>
Cluster Diagram <a href="#">Making Scatter Plots/Trend lines in Excel</a>	

**Laboratory Quality Systems**  
**Unit II: Quality Assurance and Quality Control**  
**(Weeks 3 - 5)**

<a href="#">How to Create a Scatter Plot in Excel</a>	
<a href="#">How to make a scatter plot in Excel</a>	
Variable Control Chart <a href="#">Control Charts in Excel</a>	<a href="#">Instructions for Creating Histogram and Control Charts in Excel</a> <a href="#">Excel File – cc.xls use for creating histogram</a>  <a href="#">Statistical Process Control Macro: Histogram and Control Charts</a> <i>(Important: How to enable Excel macros)</i>  <a href="#">Demo 2 Statistical Process Control Macro.xls – Example (Data is highlighted)</a>

**Note:** You can find a variety of sources on how to use Excel on the web using a simple google search

**Readings**

- [Montgomery. 2009. 6th Edition. Introduction to Statistical Quality Control](#) (pg. 226-245)
- [Montgomery. 2009. Appendix VI](#)
- [Wheeler & Chambers. 2010. 3rd Edition. Understanding Statistical Process Control, Ch. 12](#)
- [Amsden & Butler. 1998. 2<sup>nd</sup> Edition. SPC Simplified Practical Steps to Quality, Ch. 2](#)
- [NCSS Statistical Software. Chapter 241 Individuals and Moving Range Charts](#)
- [Amsden & Butler. 1998. 2nd Edition. SPC Simplified Practical Steps to Quality, Ch. 4](#)

**Assignments**

- [Homework #2- Statistical Process Control](#) - Due by Midnight on Monday, February 23, 2026 (10 pts)  
Submit via e-mail to [outreach@otsc.tamu.edu](mailto:outreach@otsc.tamu.edu)

**Laboratory Quality Systems**  
**Unit II: Quality Assurance and Quality Control**  
**(Weeks 3 - 5)**

**Topic # 2 - Quality Control**

***Presentations***

- [Quality Assurance and Quality Control](#) (15 min.) | [PDF](#)
- [Uncertainty](#) (14 min.) | [PDF](#) | [Excel Sheet](#)
- [Analyst Qualification](#) (12 min.) | [PDF](#)
- [Proficiency Testing](#) (21 min.) | [PDF](#)
- [Reference Material](#) (18 min.) | [PDF](#)
- [Control of Non-conforming Work](#) (8 min.) | [PDF](#)
- [Records and Reporting for Quality Assurance](#) (16 min.) | [PDF](#)

***Excel Demonstrations***

Demonstration	Associated Excel Files and other files
<a href="#">Homogeneity</a> (3 min.) <a href="#">Demo Excel File</a>	<a href="#">Homogeneity Excel File</a> <a href="#">Homogeneity (Annotated Example)</a>
<a href="#">Stability</a> (2 min.) <a href="#">Demo Excel File</a>	<a href="#">Stability Excel File</a> <a href="#">Stability (Annotated Example)</a>
<a href="#">Dixon Outlier</a> : (6 min.) Note: The SD of control data mentioned in this presentation can be found in: <a href="#">OTSC</a> <a href="#">Uncertainty of Measurement Estimation</a>	<a href="#">Dixon Outlier: Use in Analyst Qualification Excel File</a> <a href="#">Dixon Q-Test Outlier Annotated Example</a>
<a href="#">Uncertainty</a> (14 min.)   <a href="#">PDF (Also listed above)</a>	Uncertainty - <a href="#">Excel Sheet</a>

***Readings***

**Quality Control Procedures**

- [Quality Control Reference Material and Benchmarking Instrument Performance](#)
- [Human and Animal Food Testing Laboratories Best Practices Manual](#)

**Laboratory Quality Systems**  
**Unit II: Quality Assurance and Quality Control**  
**(Weeks 3 - 5)**

**Proficiency Testing**

- [International Harmonized Protocol for the Proficiency Testing of Analytical Chemistry Laboratories](#)
- Review [OTSC – TAMU AgriLife Research Aflatoxin Proficiency Testing and Control Program](#)

(Login Information: Lab Number-101 ; Password –password)

**Uncertainty**

- [A Beginner's Guide to Uncertainty of Measurement](#)
- [Analytical Measurement Uncertainty ISO/IEC 17025: 2005 \(APHL, AFDO, AAFCO\)](#)
- [P103B-Annex- Policy on Estimating Measurement Uncertainty for Life Sciences Testing Labs](#)

**Assignments**

- [Homework #3 – Uncertainty](#) Due by Midnight on Monday, March 2, 2026 (10 pts)  
Submit via e-mail to [outreach@otsc.tamu.edu](mailto:outreach@otsc.tamu.edu)
- [Homework #4 – Non-conforming work](#) Due by Midnight on Monday, March 9, 2026 (10 pts)  
Submit via e-mail to [outreach@otsc.tamu.edu](mailto:outreach@otsc.tamu.edu)

**Discussions**

- Graded Discussion # 2: Proficiency Testing (Canvas)  
Review the following 2018 Round 1 and Round 2 reports for Total and B1 Aflatoxin Results respectively from the [OTSC – TAMU AgriLife Research Aflatoxin Proficiency Testing and Control Program](#). To view the reports, go to PT website - <http://pt.tamu.edu> and click on View Proficiency Testing Reports and use the following information: Lab Number-101 ; Password –password

Compare the Round 1 and Round 2 results for Total and B1 Aflatoxin respectively and address the following:

1. Presence of Outliers
2. # of Labs that had satisfactory results
3. What should a lab do if their results is not satisfactory?
4. Why should a laboratory participate in a Proficiency Testing Program?

**Due by Midnight on Monday, February 23, 2026 (5 pts)**

Submit in course Google Group under Graded Discussion #2 Thread;

Access google group @ [Laboratory Quality Systems – Spring 2026 - Google Groups](#)

**Laboratory Quality Systems**  
**Unit II: Quality Assurance and Quality Control**  
**(Weeks 3 - 5)**

E-mail: [lqs\\_2026\\_spring@lists.tamu.edu](mailto:lqs_2026_spring@lists.tamu.edu)

Graded Discussion # 3 (Canvas)

All laboratory results need to account for a level of uncertainty. What are sources of uncertainty in laboratory results? What types of information should accompany laboratory results to account for this uncertainty. (5 pts)

**Due by Midnight on Monday, March 16, 2026 pts)**

Submit in course Google Group under Graded Discussion #3 Thread;

Access google group @ [Laboratory Quality Systems – Spring 2026 - Google Groups](#)

E-mail: [lqs\\_2026\\_spring@lists.tamu.edu](mailto:lqs_2026_spring@lists.tamu.edu)

### **References**

#### **Quality Control Procedures**

- [One Sample Strategy Handbook](#)
- [OTSC SOP Aflatoxin in Feeds \(Corn and Cottonseed Meal Product\) by HPLC/PHRED](#)
- [OTSC SOP Aflatoxin in Feeds by UHPL/FLD](#)
- [OTSC SOP on Analyst Qualification](#)
- [OTSC SOP on Dixon Outliers](#)
- [OTSC Analyst Qualification Example](#)
- [Assuring the Quality of Test Results from ORA-FDA Laboratory Manual of Quality Policies \(Pg.41\)](#)
- [Control of Non-Conforming Work from ORA - FDA from ORA-FDA Laboratory Manual of Quality Policies \(Pg.17\)](#)
- [Corrective Action Procedure from ORA - FDA from ORA-FDA Laboratory Manual of Quality Policies \(Pg.18\)](#)

#### **Uncertainty**

- [ISO/IEC Guide 98-3: Uncertainty of Measurement –Part 3: Guide to the expression of uncertainty in Measurement](#)

**Laboratory Quality Systems**  
**Unit II: Quality Assurance and Quality Control**  
**(Weeks 3 - 5)**

- [Sources of Uncertainty in Measurement for Every Uncertainty Budget](#)
- [OTSC Uncertainty of Measurement Estimation](#)