



The Science of Beer



Setting the Standard: A Deep Dive into Quality

July 31–August 4, 2017 ■ Fort Collins, Colorado, U.S.A.

Monday – July 31

- **Introduction and Overall Scope of Course**
- **Microbiology Day 1 Yeast and more Yeast!**
 - Physiology and Metabolism of *Saccharomyces cerevisiae*
 - Cell Counting Basics
 - Yeast health (viability and vitality)
 - Lab Exercises
 - Analysis of Yeast stats and what it means in your brewery
 - Beer Inclusion identification
 - Lab Exercises
 - Yeast Pitching basics
 - Propagation
 - Cone to Cone Pitching
 - How and when to harvest yeast
 - Math lessons!
- **Tour of New Belgium Brewing and Dinner**

Tuesday – August 1

- **Microbiology Day 2 Contamination**
 - Contamination in Beer and Yeast
 - Types of Media and why/how to use them
 - Reading and identifying contamination on plates
 - Identification techniques (PCR, MALDI-TOF, Sequencing)
 - Lab Exercises
 - Where to start with a Micro program
 - Resources for Micro in our Industry
- **Packaging Quality**
 - Packaging supplier quality
 - Setting expectations with suppliers
 - Regular visits

- Quality expectations
 - Using data to hold suppliers accountable
 - Building partnerships to maximize supplier relationships
- In-process quality
 - Critical parameters to monitor for package ops
 - Total package oxygen
 - Fill volume
 - Can seams
- Voice of the customer
 - Using feedback to improve the quality of your product
 - Group problem solving exercises based on customer complaints
 - Review/ discussion of problem solving exercises, “real” results
- **Tour of Odell Brewing and Social Hour**

Wednesday – August 2

- **Chemistry in Brewing**
 - Good Laboratory Techniques - Pipetting, glassware, balances, and cleaning
 - Sampling, degassing, and sample stability
 - Conversions and ASBC Calculators
 - Specific Gravity and Calculated Values
 - **Exercise:** Pipet and building a calibration curve
 - pH and Titratable Acidity
 - What you can do with a spectrophotometer - Wort and Beer Methods
 - Color and Tristimulus
 - **Exercise:** Color, tristimulus, and IBUs
 - Alcohol
 - SO₂
 - Gluten
 - **Exercise:** Anton Paar
 - Physical Stability and Turbidity
 - Beer Inclusions
 - **Exercise:** Microscopic staining for beer inclusions
 - Chromatography – Introduction to GC and LC
 - VDKs
 - IAAs Versus BUs
 - DMS
 - Fermentation Volatiles
 - **Exercise:** Chromatography Lab Visit
 - Foam
 - Metals
 - Hop Aroma
 - Off flavors, flavor Thresholds, and fishbones
 - Flavor Stability
 - Method Validation and Proficiency Schemes.
 - Lab Design, maintenance, and outsourcing

- **Open night – no activities**

Thursday – August 3

Sensory

- Introduction to Sensory Analysis
 - Overview of Flavor and Sensory Evaluation
 - Overview of Sensory Principles
 - Sensory Program Parameters
- Building a Sensory Program
 - Panelist Selection
 - Sensory Laboratory Space
- Panelist Training
 - Introduction to Attribute Training
 - Activity: Flavor Training
- Sensory Evaluation in Quality Control
 - Maintenance of Product Quality
 - Measuring Quality
- Sensory Evaluation Throughout the Process
 - Sampling Plans
 - Documentations and Reaction Plans
- Statistical Quality Control
- Sensory Methods
 - Discrimination Testing
 - Threshold Testing
 - Shelf Life Analysis
 - Activity: Case studies and method selection
- Validation
 - Measuring Panelist Acuity
 - Measuring Panel Performance
 - Activity: Validating and Utilizing Panelist Data
- Sensory Evaluation in New Product Development
 - Descriptive Analysis Principles and Practices
 - Activity: Running a Descriptive Analysis Panel
- Conclusion
 - Review of Best Practices

Sensory Beer Dinner at Blue Moon Brewing in Denver! – This will also be a LABS meeting with food and beer paired to compliment the sensory lessons taught this day.

Friday – August 4

Raw Materials

As more details become available, this schedule will be updated accordingly

QA Management Systems

As more details become available, this schedule will be updated accordingly