



# IGP Institute

## IGP–KSU Practical Flour and Dough Testing

August 5–9, 2024

### Course Description:

The focus of Practical Flour and Dough Testing is the hands-on application of analytical tests used to determine attributes of different flours. Participants are introduced to the analytical techniques that they may encounter when working with flour mills and bakeries. This five-day course will provide a broad understanding of standard analytical methods and procedures commonly used in flour quality testing through participant hands-on exercises. This course will teach how analyses are done as well as how to evaluate, interpret, and use the results. The course also introduces wheat classes and uses, lab milling and grinding methods, and test baking methods and applications for breads, cakes, and cookies.

Basic analytical tools used for flour analysis that will be covered in the course include moisture, protein, ash, pH, flour color, TTA, SRC, gluten washing, glutomatic, damaged starch, and rheological tests such as farinograph, dough lab, falling number, mixolab, alveograph, and RVA that measure various dough properties. Lab milling machines will include the Quadrumat junior and senior, Buhler MLU, and Chopin lab mill.



### Learning Outcomes

- Discuss the standard analytical flour and dough tests used in the commercial milling and baking industry
- Discover the scientific principles of the standard analytical flour and dough tests
- Practice how the standard analytical flour and dough tests are conducted
- Analyze the data collected by standard analytical flour and dough tests
- Interpret the test results to understand relative flour quality



### Who Should Attend

- Employees of flour milling companies
- Ingredient suppliers
- Equipment manufacturers
- Baking companies

**See the full course agenda on the back.**

**KANSAS STATE**  
**UNIVERSITY**

IGP Institute  
Department of Grain Science and Industry

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# IGP–KSU Practical Flour and Dough Testing – Course Agenda

## August 5–9, 2024

### Day 1 – Monday

**8:00 – Depart hotel for KSU Waters Hall Annex (IGP shuttle)**

**8:15 – Welcome and Introductions**

- Course Outline and Overview
- IGP Overview and Offerings

**Understanding U.S. Wheat Classes and Basic Grades**

- Define the six classes of U.S. wheat and uses

**Introduction to Lab Milling and Grinding Methods**

- Overview of lab milling machines and uses.
- Understanding of particle size distribution.

**Break**

**Quadrumat Junior**

- Overview of machine principles and grinding operations
- Milling wheat samples

**Quadrumat Senior**

- Overview of machine principles and grinding operations
- Milling wheat samples

**12:00 – Lunch (Shellenberger 204)**

**Buhler MLU**

- Overview of machine principles and grinding operations
- Milling wheat samples

**Chopin Lab Mill**

- Overview of machine principles and grinding operations
- Milling wheat samples

**Break**

**Introduction to Flour Composition**

- Review the basic components of wheat flour: starch, gluten proteins, arabinoxylans.

**NIR Moisture, Ash, and Protein**

- Discuss the scientific principles used in NIR measurement of moisture, ash, and protein.
- Discuss the definition and importance of moisture basis.

**Depart for hotel / Goolsby's (IGP shuttle)**

**5:00 – IGPI sponsored social hour (drinks and appetizers provided) Goolsby's, 1212 Bluemont Ave. Adjourn as needed**

### Day 2 – Tuesday

**8:00 – Depart hotel for KSU Waters Hall Annex (IGP shuttle)**

**8:15 – pH and TTA**

- Recognize the difference between pH and TTA measurements
- Explain how to conduct pH and TTA testing

**Flour Color**

- Explain which flour components contribute to color
- Discuss why measurement of flour color is important
- Describe the methods to measure flour color

**Break**

**Falling Number**

- Demonstrate and compare methods of alpha-amylase testing.
- Discover physical and chemical changes that occur when starch gelatinizes and then retrogrades.

**12:00 – Lunch (Shellenberger 204)**

**1:00 – Oven Moisture and Ash**

- Explain how oven moisture and ash tests are conducted.
- Measure moisture of flour

**LECO Protein**

- Discover the combustion method to measure protein.

**Break**

**Hand Gluten Washing**

- Isolate gluten from several types of flour and use the information in conjunction with other analyses during the course to consider flour applications

**Glutomatic**

- Evaluate the mechanized version of gluten washing

**5:00 – Adjourn and depart for hotel (IGP shuttle)**

## Day 3 – Wednesday

**8:00 – Depart hotel for KSU Waters Hall Annex (IGP shuttle)**

### 8:15 – Alpha-Amylase Determination

- Identify what alpha-amylase is and its role in baking
- Discover the scientific principles used in alpha-amylase measurement

### RVA

- Demonstrate and compare methods of alpha-amylase testing.
- Observe use of RVA to measure starch cooking and pasting behavior.

### Break

### Damaged Starch

- Identify how starch is damaged and its role in baking
- Explain the scientific principles used in damage starch measurement
- Test damaged starch and interpret test results using the SD Matic

**12:00 – Lunch (Shellenberger 204)**

### 1:00 – SRC Manual Method

- Identify impact of flour components on water holding capacity
- Discover the scientific principles used in SRC measurement

### Break

### Mixolab

- Explain the measurements obtained from mixolab.
- Observe and describe how the mixolab test differs from other recording dough mixers

**5:00 – Adjoin and depart for hotel (IGP shuttle)**

## Day 4 – Thursday

**8:00 – Depart hotel for Shellenberger Baking Lab (IGP shuttle)**

### 8:15 – Test Baking Methods and Applications

- Conduct sponge and dough and straight dough bread test baking methods.

**12:00 – Lunch (Shellenberger 204)**

## Test Baking Continued

- Make sugar snap cookie and layer cakes with test baking methods for soft wheat flours.
- Evaluate breads, cakes, and cookies made during the test baking process.
- Perform volume and Ccell measurement on produced samples.

**5:00 – Adjoin and depart for hotel (IGP shuttle)**

## Day 5 – Friday

**8:00 – Depart hotel for KSU Waters Hall Annex (IGP shuttle)**

### 8:15 – Dough Lab

- Test flour samples, interpret the data from dough lab and discuss applications.

### Farinograph

- Test flour samples, interpret the data from farinographs and discuss applications

**12:00 – Lunch (Shellenberger 204)**

### AlveoLAB

- Explain the scientific principles of the alveograph test
- Explore how the alveograph test is conducted
- Course Review and Wrap-Up

### Course Evaluations and Presentation of Certificates

**4:00 – Adjoin and depart for hotel (IGP shuttle)**

## Course Instructors

**Dr. Elisa Karkle** – Assistant Professor for Baking Science, Department of Grain Science and Industry, Kansas State University, 785-532-6194, [ekarkle@ksu.edu](mailto:ekarkle@ksu.edu)

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