

# Cereal & Food Sciences (CFS)

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**CFS 194. Individual Study. 1-3 Credits.**

**CFS 196. Field Experience. 1-15 Credits.**

**CFS 199. Special Topics. 1-5 Credits.**

**CFS 200. Introduction to Food Systems. 3 Credits.**

The fundamentals of food science and food safety will be introduced with emphasis on how food components and processing affect quality and safety of foods.

**CFS 210. Introduction to Food Science and Technology. 3 Credits.**

Overview of food components, food quality, nutrition, processing, packaging, safety, sanitation laws, sensory evaluation, distribution, and utilization.

**CFS 291. Seminar. 1-3 Credits.**

**CFS 292. Global Practicum: Study Abroad. 1-15 Credits.**

Pre-Arranged study at accredited foreign institutions (study abroad), domestic institutions (National Student Exchange) or on approved study abroad programs. Pre-requisite: Sophomore standing and prior approval by International Student and Study Abroad Services and major department. Graded 'P' or 'F' (Undergraduate), or 'S' or 'U' (Graduate).

**CFS 294. Individual Study. 1-5 Credits.**

**CFS 299. Special Topics. 1-5 Credits.**

**CFS 370. Food Processing I. 3 Credits.**

This course is designed to provide students with an introduction to food processing methods. The course will provide hands-on experience with a focus on basic food processing methods. Recommended Prereq: CFS 210.

**CFS 379. Global Seminar. 1-6 Credits.**

NDSU instructed experience or field study in a foreign country. Conducted in English for residence credit. Pre-requisite: Prior approval by International Student and Study Abroad Services and major department. May be repeated. Standard Grading.

**CFS 391. Seminar. 1-3 Credits.**

**CFS 392. Global Practicum: Study Abroad. 1-15 Credits.**

Pre-Arranged study at accredited foreign institutions (study abroad), domestic institutions (National Student Exchange) or on approved study abroad programs. Pre-requisite: Sophomore standing and prior approval by International Student and Study Abroad Services and major department. Graded 'P' or 'F' (Undergraduate), or 'S' or 'U' (Graduate).

**CFS 394. Individual Study. 1-5 Credits.**

**CFS 397. Fe/Coop Ed/Internship. 1-4 Credits.**

**CFS 399. Special Topics. 1-5 Credits.**

**CFS 430. Food Unit Operations. 3 Credits.**

Thermodynamics, materials and energy balance, fluid flow, heat transfer, heat exchange, all related to food processing. Prereq: CFS 470 and MATH 146. {Also offered for graduate credit - see CFS 630.}

**CFS 450. Cereal Technology. 3 Credits.**

Discussion of cereal grains, their properties, evaluation, and utilization. {Also offered for graduate credit - see CFS 650.}

**CFS 452. Food Laws and Regulations. 3 Credits.**

Regulations, laws, and dynamics governing development of food policy. {Also offered for graduate credit - see CFS 652.}

**CFS 460. Food Chemistry. 3 Credits.**

Study of food components including water, carbohydrates, lipids, proteins, vitamins, minerals, and enzymes. Recommended Prereq: CFS 210, CHEM 341, CHEM 341L. {Also offered for undergraduate credit - see CFS 660.}

**CFS 461. Food Chemistry Laboratory. 1 Credit.**

Laboratory isolation, observation of characteristics, and quantitation of food components. Recommended Coreq: CFS 460. {Also offered for graduate credit - see CFS 661.}

**CFS 462. Food Ingredient Technology. 3 Credits.**

The course will present principles and discuss utilization of food ingredients. It provides chemical and physical nature of food ingredients; functions and effects on chemical, rheological, microbiological, and nutritional properties of foods. Distribution and legislation of food ingredients, sources, properties and their applications will be discussed. This course also will shed light on the molecules that constitute our macro and micro nutrients and will attempt to clarify a number of the food issues using the best evidence available. Prereq or Co-req: CFS 460. {Also offered for graduate credit - See CFS 662.}

**CFS 464. Food Analysis. 3 Credits.**

Principles, applications, and practice of methods for quantitative determination of food components. 2 lectures, 1 three-hour laboratory. Prereq: CFS 210. {Also offered for graduate credit - see CFS 664.}

**CFS 470. Food Processing II. 3 Credits.**

This course is designed to provide students with an in-depth academic and practical exposure to food processing methods and the food industry. Concepts in quality control systems and sanitation will be discussed. Recommended Prereq: CFS 370. {Also offered for graduate credit - see CFS 670.}

**CFS 471. Food Processing Laboratory. 1 Credit.**

Field trips, experiments on freezing, freeze-drying, spray drying, canning, beverage production, water activity measurements, shelf life, and quality control. Recommended Coreq: CFS 470. {Also offered for graduate credit - see CFS 671.}

**CFS 472. Cereal and Food Fermentation. 3 Credits.**

This is an advanced course with a focus on topics in food fermentation. This course will integrate principles of food microbiology, biochemistry, and discussion of food fermentation processing. Areas covered include microorganisms involved in fermentation; dairy, meat, vegetable, cereal grain, fruit and unique fermented foods and their processing, and food safety aspects of fermented foods. Prereq: CFS 370 or MICR 350 or MICR 453. {Also available for graduate credit - See CFS 672.}

**CFS 474. Sensory Science of Foods. 3 Credits.**

The science used in the evaluation of flavor, color, and texture of foods. Experiential approaches will be used to evaluate sensory characteristics of foods. Recommended Prereq: STAT 330. {Also offered for graduate credit - see CFS 674.}

**CFS 480. Food Product Development. 3 Credits.**

This course is designed to provide students the opportunity to incorporate the basic principles of food science in the theoretical development of food products. (Food Science Capstone) Prereq: CFS 453, CFS 460, CFS 464, CFS 470. {Also offered for graduate credit - see CFS 680.}

**CFS 491. Seminar. 1-5 Credits.**

**CFS 492. Global Practicum: Study Abroad. 1-15 Credits.**

Pre-Arranged study at accredited foreign institutions (study abroad), domestic institutions (National Student Exchange) or on approved study abroad programs. Pre-requisite: Sophomore standing and prior approval by International Student and Study Abroad Services and major department. Graded 'P' or 'F' (Undergraduate), or 'S' or 'U' (Graduate).

**CFS 494. Individual Study. 1-5 Credits.**

**CFS 496. Field Experience. 1-15 Credits.**

**CFS 499. Special Topics. 1-5 Credits.**

**CFS 630. Food Unit Operations. 3 Credits.**

Thermodynamics, materials and energy balance, fluid flow, heat transfer, heat exchange, all related to food processing. {Also offered for undergraduate credit - see CFS 430.}

**CFS 650. Cereal Technology. 3 Credits.**

Discussion of cereal grains, their properties, evaluation, and utilization. {Also offered for undergraduate credit - see CFS 450.}

**CFS 652. Food Laws and Regulations. 3 Credits.**

Regulations, laws, and dynamics governing development of food policy. Cross-listed with SAFE 652 and AGEC 652. {Also offered for undergraduate credit - see CFS 452.}

**CFS 660. Food Chemistry. 3 Credits.**

Study of food components including water, carbohydrates, lipids, proteins, vitamins, minerals, and enzymes. {Also offered for undergraduate credit - see CFS 440.}

**CFS 661. Food Chemistry Laboratory. 1 Credit.**

Laboratory isolation, observation of characteristics, and quantitation of food components. Coreq: CFS 660. {Also offered for undergraduate credit - see CFS 461.}

**CFS 662. Food Ingredient Technology. 3 Credits.**

The course will present principles and discuss utilization of food ingredients. It provides chemical and physical nature of food ingredients; functions and effects on chemical, rheological, microbiological, and nutritional properties of foods. Distribution and legislation of food ingredients, sources, properties and their applications will be discussed. This course also will shed light on the molecules that constitute our macro and micro nutrients and will attempt to clarify a number of the food issues using the best evidence available. Prereq: CFS 660. {Also available for undergraduate credit - See CFS 462.}

**CFS 664. Food Analysis. 3 Credits.**

Principles, applications, and practice of methods for quantitative determination of food components. 2 lectures, 1 three-hour laboratory. Prereq: CFS 660. {Also offered for undergraduate credit - see CFS 464.}

**CFS 670. Food Processing II. 3 Credits.**

This course is designed to provide students with an in-depth academic and practical exposure to food processing methods and the food industry. Concepts in quality control systems and sanitation will be discussed. {Also offered for undergraduate credit - see CFS 470.}

**CFS 671. Food Processing Laboratory. 1 Credit.**

Field trips, experiments on freezing, freeze-drying, spray drying, canning, beverage production, water activity measurements, shelf life, and quality control. Coreq: CFS 670. {Also offered for undergraduate credit - see CFS 471.}.

**CFS 672. Cereal and Food Fermentation. 3 Credits.**

This is an advanced course with a focus on topics in food fermentation. This course will integrate principles of food microbiology, biochemistry, and discussion of food fermentation processing. Areas covered include microorganisms involved in fermentation; dairy, meat, vegetable, cereal grain, fruit and unique fermented foods and their processing, and food safety aspects of fermented foods. {Also available for undergraduate credit - See CFS 472.}.

**CFS 674. Sensory Science of Foods. 3 Credits.**

The science used in the evaluation of flavor, color, and texture of foods. Experiential approaches will be used to evaluate sensory characteristics of foods. {Also offered for undergraduate credit - see CFS 474.}.

**CFS 680. Food Product Development. 3 Credits.**

This course is designed to provide students the opportunity to incorporate the basic principles of food science in the theoretical development of food products. {Also offered for undergraduate credit - see CFS 480.}.

**CFS 690. Graduate Seminar. 1-3 Credits.****CFS 692. Global Practicum: Study Abroad. 1-15 Credits.**

Pre-Arranged study at accredited foreign institutions (study abroad), domestic institutions (National Student Exchange) or on approved study abroad programs. Pre-requisite: Sophomore standing and prior approval by International Student and Study Abroad Services and major department. Graded 'P' or 'F' (Undergraduate), or 'S' or 'U' (Graduate).

**CFS 695. Field Experience. 1-15 Credits.****CFS 696. Special Topics. 1-5 Credits.****CFS 725. Food Policy. 3 Credits.**

Provides quantitative tools and models used to analyze general food safety policies. Three lectures. Prereq: SAFE 670. Cross-listed with AGE 725 and SAFE 725.

**CFS 758. Fundamentals of Flour Testing and Baking. 3 Credits.**

Flour testing, industrial, and experimental bread baking. Production methods, ingredients, and baking reactions. Lectures and laboratories. Prereq: CFS 650.

**CFS 759. Milling. 3 Credits.**

Experimental and industrial feed and flour milling. Production, equipment, and factors involved in the milling process. Lectures and laboratories. Prereq: CFS 650.

**CFS 760. Pasta Processing. 3 Credits.**

Durum wheat quality, pasta production, and pasta quality evaluation. Lectures and laboratories. Prereq: CFS 650.

**CFS 761. Malting and Brewing. 3 Credits.**

Barley and malt quality; malting and brewing. Lectures and laboratories. Prereq: CFS 650.

**CFS 764. Carbohydrate Chemistry. 2 Credits.**

This course focuses on developing i) knowledge on structural features of carbohydrates and ii) skills for structural characterization of carbohydrates in plants and microorganisms using analytical methods. Recommended prereq: Introductory Chemistry/Biochemistry class.

**CFS 765. Advanced Cereal and Food Chemistry I. 4 Credits.**

Physicochemical, structural, functional, and analysis of cereal and food carbohydrates and enzymes. Biochemical aspects of these components will also be presented.

**CFS 766. Advanced Cereal and Food Chemistry II. 4 Credits.**

Physicochemical, structural, and functional properties of cereal and food proteins and lipids in food systems.

**CFS 790. Graduate Seminar. 1-3 Credits.**

**CFS 791. Temporary/Trial Topics. 1-5 Credits.**

**CFS 792. Graduate Teaching Experience. 1-6 Credits.**

**CFS 793. Individual Study. 1-5 Credits.**

**CFS 794. Practicum/Internship. 1-8 Credits.**

**CFS 795. Field Experience. 1-15 Credits.**

**CFS 796. Special Topics. 1-5 Credits.**

**CFS 797. Master's Paper. 1-3 Credits.**

**CFS 798. Master's Thesis. 1-10 Credits.**

**CFS 892. Graduate Teaching Experience. 1-6 Credits.**

**CFS 899. Doctoral Dissertation. 1-15 Credits.**