Cereal Science

Department Information

- **Department Chair:**
  Richard Horsley, Ph.D.
- **Program Coordinator:**
  Frank Manthey, Ph.D.
- **Department Location:**
  Plant Sciences, Loftsgard Hall
- **Department Phone:**
  (701) 231-7971
- **Department Web Site:**
  www.ndsu.edu/agriculture/academics/academic-units/plant-sciences/graduate-programs (http://www.ndsu.edu/agriculture/academics/academic-units/plant-sciences/graduate-programs/)
- **Application Deadline:**
  International applications are due May 1 for fall and October 1 for spring. Domestic applicants should apply at least one month prior to the start of classes.
- **Credential Offered:**
  Ph.D., M.S.
- **English Proficiency Requirements:**
  TOEFL iBT 71, IELTS 6; Duolingo 105

Cereal Science is a graduate program in the College of Agriculture Food Systems and Natural Resources and is administered by the Department of Plant Sciences. The Cereal Science graduate program offers graduate study leading to the Master of Science (M.S.) and Doctor of Philosophy (Ph.D.) degrees in Cereal Science. Advanced work may involve research in the areas of proteins, carbohydrates, enzymes, and lipids of cereals, legumes, and other northern-grown crops; barley malting and brewing; and wheat milling, baking, and pasta processing. Functional foods and stability of bioactive compounds in food systems are also predominant areas of research.

Research Facilities and Equipment

Faculty in the Cereal Science graduate program maintain specialized equipment that evaluates cereal and food quality, including laboratory equipment such as an ICP spectrophotometer, gas chromatographs, LC-MS, GC-MS, high-performance liquid chromatographs, various electrophoretic devices, a differential scanning calorimeter, and Rapid ViscoAnalyzer.

Flour mills, ranging up to pilot-plant size; two completely equipped bake shops; continuous bread-baking equipment; rheological instruments for dough testing; several pasta-processing units; malting equipment; Asian noodle making equipment; soy milk/tofu processing machines; a wet processing pilot plant; laboratory-scale UHT processing unit; HT/ST extruder; and a microbrewery are some examples of the specialized equipment.

The Cereal Science program has a close working relationship with both the Northern Crops Institute and the USDA Hard Red Spring and Durum Wheat Quality Laboratory. All three are located in the newly opened (June 2024) Peltier Complex. This 85 million dollar facility supports a wide range of research involving food science, meat science, muscle biology, food safety, nutrition, consumer sensory traits, and the development of new agricultural products.

The Cereal Science graduate program is open to all qualified graduates of universities and colleges of recognized standing. To be admitted with full standing status to the program, the applicant must meet the Graduate School requirements and have adequate preparation in biochemistry/chemistry and the biological sciences, including microbiology.

Financial Assistance

Applicants must apply to the Graduate School and be accepted in full or conditional status before being eligible for an assistantship in the Cereal Science graduate program. All graduate students must qualify and be awarded a Graduate Research Assistantship. Alternative support, equivalent to a Graduate Research Assistantship, may be provided to a student by a sponsor such as a private company, university or government. The number of Graduate Research Assistantships varies from year to year, depending on industrial support and grant funding. In addition to a stipend, graduate assistants receive a tuition waiver. Tuition waivers cover base tuition for NDSU graduate credits only. Students are responsible for differential tuition, student fees, and tuition for non-graduate level credits taken or Cooperative Education credits.

Selection of the major adviser will be made based on the student's interest, source of funding, the availability of faculty members and a common desire of the student and professor to work together on a program that will enable the student to attain the desired degree. If a Graduate Research Assistantship is assigned to a specific research project, the project leader will be the student’s major adviser .

Master of Science

The Master of Science program requires a minimum of 21 semester credits of course work with an overall GPA of 3.0 or better, as well as 10 research credits (CFS 798).

With assistance from the advisor, a supervisory/advisory and examining committee is established and a plan of study developed. The student is required to prepare and defend a written research proposal. The plan of study and written research proposal must be approved within the first four and six months of study, respectively. For M.S. students, a final oral examination is required, where the student defends the thesis and is asked questions covering academic subject matter.

Code	Title	Credits
CFS 650	Cereal Technology	3
CFS 790	Graduate Seminar	2
PLSC 710	Professional Development I	1
CFS 798	Master's Thesis	10
Statistics (one of the following courses)		**3**
PLSC 724	Field Design I	
STAT 662	Introduction to Experimental Design	
STAT 725	Applied Statistics	
Technology Group		**6**
CFS 630		
CFS 670	Food Processing II	
CFS 671	Food Processing Laboratory	
CFS 758	Fundamentals of Flour Testing and Bakng (s/b Baking)	
CFS 759	Milling	
CFS 760	Pasta Processing	
CFS 761	Malting and Brewing	
Science Group		**6**
MICR 653	Food Microbiology	
CFS 660	Food Chemistry	
CFS 661	Food Chemistry Laboratory	
CFS 662	Food Ingredient Technology	
CFS 664	Food Analysis	
CFS 672	Cereal and Food Fermentation	
CFS 674	Sensory Science of Foods	
CFS 764	Carbohydrate Chemistry	
CFS 765	Advanced Cereal and Food Chemistry I	
CFS 766	Advanced Cereal and Food Chemistry II	
MICR 752		
Total Credits		30 (minimum)

Doctorate of Philosophy (Ph.D.)

The Ph.D. requires 90 credits post-baccalaureate. If a student has previously earn a master's degree, no fewer than 60 credits are required to complete the Ph.D.

The Ph.D. program requires the completion of a minimum of 31 semester credits of required course work with an overall GPA of 3.0 or better, as well as 25 research credits (CFS 899). Remaining credits can be fulfilled as elective courses or as additional research credits (CFS 899). With assistance from the advisor, a supervisory/advisory and examining committee is established and a plan of study developed.

The student is required to prepare and defend a written research proposal. The plan of study and written research proposal must be approved within the first six and nine months of study, respectively. Ph.D. candidates are required to take a preliminary written and oral examination covering academic subject matter and a final oral defense of a research-based dissertation.

Code	Title	Credits
CFS 650	Cereal Technology (Students that have previously taken CFS 650 can opt to take additional CFS 899 credits or another 600/700 course worth 3 credits.)	3
PLSC 710	Professional Development I	1
PLSC 711	Professional Development II	1
CFS 765	Advanced Cereal and Food Chemistry I	4
CFS 766	Advanced Cereal and Food Chemistry II	4
PLSC 790	Graduate Seminar	2
CFS 892	Graduate Teaching Experience	2
PLSC 899	Doctoral Dissertation	30
Statistics (one of the following courses)		**3**
STAT 662	Introduction to Experimental Design	
PLSC 724	Field Design I	
STAT 725	Applied Statistics	
Technology Group		**9**
CFS 630		
CFS 670	Food Processing II	
CFS 671	Food Processing Laboratory	
CFS 759	Milling	
CFS 760	Pasta Processing	
CFS 761	Malting and Brewing	
Science Group		**6**
CFS 660	Food Chemistry	
CFS 661	Food Chemistry Laboratory	
CFS 662	Food Ingredient Technology	
CFS 664	Food Analysis	
CFS 672	Cereal and Food Fermentation	
CFS 674	Sensory Science of Foods	
CFS 764	Carbohydrate Chemistry	
MICR 752		
Additional Credits		30

- If the student has had an equivalent statistics course to the one stated above or if the student requires additional training in statistics, the appropriate statistics course will be taken as agreed upon by the graduate student and the student's supervisory committee.

An accelerated **Master of Science program** is available for students currently enrolled in the undergraduate Food Science program at North Dakota State University. Students will be required to complete 31 credits consisting of 19 didactic credits (600/700 level), 2 graduate seminar credits (CFS 790) and 10 research credits (CFS 798) and maintain a graduate GPA of 3.0. Students will be required to complete a thesis.

Fifteen (15) of the didactic credits can be used to meet the requirement for the B.S. degree. A graduate stipend or assistantship will not be provided until the B.S. degree is granted. However, students are eligible for hourly funding (i.e., time slip) if available at any time after being accepted into the accelerated M.S. program and may qualify for tuition waiver on graduate courses. Upon completion of the B.S. degree requirement, students are eligible for assistantships pending availability. Differential tuition applies. Graduate tuition rates will apply to graduate level courses while undergraduate tuition applies to undergraduate courses.

Eligibility and Admission:

An online submission to the Graduate School is required. Students interested in the accelerated M.S. degree should consider submitting the application during their junior year or just before their senior year. For eligibility and admission please see information below.

At the time of application, the student:

- Must have completed at least **60 credits** towards their B.S. degree before conditional admission.
- Must have completed at least **30 credits** at NDSU before conditional admission.
- Must have a cumulative **GPA of 3.5** at NDSU to be eligible for conditional admission.
- Must have completed an introductory food science course CFS 210 Introduction to Food Science and Technology, CFS 370 Food Processing I, MATH 146 Applied Calculus I or higher and CHEM 121 General Chemistry I.

- Must have completed or be concurrently taking MICR 350 General Microbiology, CHEM 341 Organic Chemistry I and BIOC 460 Foundations of Biochemistry and Molecular Biology I. MICR 202 Introductory Microbiology, CHEM 240 Survey of Organic Chemistry, and BIOC 260 Elements of Biochemistry courses, respectively, cannot serve as substitutes for the aforementioned courses.

Rules for Accepted Students:

- All admissions will be conditional. The minimum condition is completion of the B.S. degree prior to full standing in M.S. program.
- No undergraduate courses (100-400) may be counted toward a M.S. degree.
- Courses completed at the 600 level prior to be accepted to the program may be counted toward a M.S. degree.
- A maximum of 15 credits in the M.S. program can be used to meet the requirements for the B.S. degree.
- Students entering the M.S. degree with a B.S. degree in hand may not use courses earned as part of the bachelors program for the M.S. requirements.
- The student must meet all of the requirements that would normally be expected of a student in the M.S. program.
- All incoming graduate students will be given a written examination before the beginning of their first semester to assess their proficiency in English / scientific writing.
- Graduate stipend or assistantship will not be provided until B.S. degree is granted. However, students are eligible for hourly funding (time slip) if available. Upon completion of the B.S. degree requirement, students are eligible for and assistantships pending availability.

Bingcan Chen, Ph.D.
University of Massachusetts-Amherst, 2012
Research Interests: Food and Cereal Chemistry

Shahidul Islam, Ph.D.
University of Western Australia, 2013
Research Interests: Grain and End-Use Quality of Hard Wheat

Zhao Jin, Ph.D.
Jiangnan University, 2014
Research Interests: Malting and Brewing

Frank Manthey, Ph.D.
North Dakota State University, 1985
Research Interests: Durum Wheat Quality, Pasta/Noodle Processing, and Milling

Jiajia Rao, Ph.D.
University of Massachusetts-Amherst, 2013
Research Interests: Food Chemistry and Ingredient Technology

Kalidas Shetty, Ph.D.
University of Idaho, 1989
Research Interests: Plant Metabolism and Food Security

Anuradha Vegi, Ph.D.
North Dakota State University, 2008
Research Interests: Teaching Techniques

Minwei Xu, Ph.D.
North Dakota State University, 2019
Research Interests: Food Processing Technology

Affiliate/Adjunct Faculty

Linda Dykes, Ph.D.
Texas A&M University, 2008
Research Interests: Wheat Quality

Jae Ohm, Ph.D.
Kansas State University, 1996
Research Interests: Cereal Chemistry