Cereal Science

www.ag.ndsu.edu/cerealscience/

Department Chair: Dr. Richard Horsley
Program Coordinator: Dr. Frank Manthey
Program Location: Plant Sciences, Loftsgard Hall
Telephone Number: (701) 231-7971
Degrees Offered: Ph.D., M.S.
Application Deadline: International applications are due May 1st for Fall and August 1 for Spring. Domestic applicants should apply at least one month.
English Proficiency TOEFL iBT 71
Requirements: IELTS 6

Program Description

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. Faculty members participating in the Cereal Science graduate program reside in Departments of Agricultural and Biosystems Engineering, Plant Sciences and Veterinary and Microbiological Sciences. Academic policies are under the governance of the Cereal Science graduate program faculty.

The Cereal Science graduate program offers graduate study leading to the M.S. and 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; wheat milling, baking, and pasta processing. Research in functional foods and stability of bioactive compounds in food systems are also predominant areas of research.

The program has a close working relationship with the Northern Crops Institute and the USDA Hard Red Spring and Durum Wheat Quality Laboratory housed in the Harris Hall complex.

Admission Requirements

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. Students who do not meet all requirements for admission, but show potential for successful graduate study, may be admitted under a conditional status.

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. Graduate tuition is waived for students with assistantships.

Selection of the major advisor will be made on the basis of 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 which 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 major advisor of the Graduate Research Assistant.

Research Facilities and Equipment

Faculty in the Cereal Science graduate program maintains specialized equipment that evaluates cereal and food quality including laboratory equipment, such as spectrophotometers, 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; soymilk/tofu processing machines; a wet processing pilot plant; labscale HT/ST extruder; and a microbrewery are some examples of the specialized equipment.

In addition, the department has access to equipment and instrumentation in the Northern Crops Institute and USDA Hard Red Spring and Durum Wheat Quality Laboratory housed in the same building complex.

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 adviser, 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 months of study. For M.S. students, a final oral examination is required, where the student defends the thesis and is asked questions covering academic subject matter.

CFS 650	Cereal Technology	3
CFS 790	Graduate Seminar	2
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	
PLSC 710	Professional Development I	1
Technology Group		6
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 653		
CFS 660	Food Chemistry	
CFS 661	Food Chemistry Laboratory	
CFS 664	Food Analysis	
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	Advanced Food Microbiology	

Doctorate of Philosophy (Ph.D.)

The Ph.D. program requires the completion of a minimum of 35 semester credits of course work with an overall GPA of 3.0 or better, as well as 25 research credits (CFS 799). With assistance from the adviser, 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 months of study. 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.

The Graduate School minimum requirement is 90 credits or no fewer than 60 credits if an M.S. degree is earned prior to the Ph.D.

CFS 650	Cereal Technology (Students that have previously taken CFS 650 can opt to take additional CFS 799 credits or another 600/700 course worth 3 credits.)	3
CFS 765	Advanced Cereal and Food Chemistry I	4
CFS 766	Advanced Cereal and Food Chemistry II	4
PLSC 790	Graduate Seminar	2
PLSC 794	Practicum	2
PLSC 899	Doctoral Dissertation	1-15
Statistics (one of the following courses)		3
PLSC 724	Field Design I	
STAT 662	Introduction to Experimental Design	
STAT 725	Applied Statistics	
PLSC 710	Professional Development I	1
PLSC 711	Professional Development II	1
Technology Group		9
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 653		
CFS 660	Food Chemistry	
CFS 661	Food Chemistry Laboratory	
CFS 664	Food Analysis	
CFS 674	Sensory Science of Foods	
MICR 752	Advanced Food Microbiology	
CFS 764	Carbohydrate Chemistry	
Additional Credits		30

- Students entering the program with an eligible M.S. Degree (i.e. within the last ten years) may transfer in 10 credits of CFS 798 or equivalent toward the 90 credit Graduate School requirement.
- 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 Advisory Committee.
- Students entering the program with an eligible M.S. Degree (i.e. within the last ten years) may transfer 20 credits of Graduate level course work toward the 90 credit Graduate School requirement. Additional credits may include research credits or coursework.

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. Graduate stipend or assistantship will not be provided until 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 MS 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 200 or CFS 210), introductory food processing (CFS 370), Math 146 or higher and general chemistry (CHEM 121, 122).
- Must have completed or is concurrently taking microbiology 350 (MICRO 350), organic chemistry (CHEM 341) and biochemistry (BIOC 460). MICRO 202, CHEM 240, and CHEM 260 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 (i.e., time slip) if available and may qualify for a tuition waiver. Upon completion of the B.S. degree requirement, students are eligible for and assistantships pending availability.

Degree Requirements for Accelerated Masters of Science Program:

Student must meet all requirements of the Food Science B.S. and Cereal Science M.S. programs to be awarded these degrees. The Graduate School has the following minimum requirements:

- Minimum of 30 credits total (of which are 6-10 thesis research credits CFS 798).
- Minimum of 16 course credits in 601-689 and/or 700-789 level. (please see the Graduate School Bulletin for more details)

Clifford A. Hall III, Ph.D.
University of Nebraska-Lincoln, 1996
Research Interests: Flaxseed, Antioxidants, Phytochemical Stability in Food Systems

Frank Manthey, Ph.D.
North Dakota State University, 1985
Research Interests: Durum Wheat Quality, Pasta/Noodle Processing, Carotenoid Deposition in durum wheat

Deland Myers, Ph.D.
Iowa State University, 1984
Research Interests: Utilization of Legume and Cereal Proteins in Nonfood and Food Applications and Their Functionality.

Paul B. Schwarz, Ph.D.
North Dakota State University, 1987
Research Interests: Malting Barley Quality

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

Senay Simsek, Ph.D.
Purdue University, 2006
Research Interests: Wheat Quality and Carbohydrate Research

Dennis P. Wiesenborn, Ph.D.
Rice University, 1988
Research Interests: Food Engineering, Process Development, Oilseeds Processing

Charlene Wolf-Hall, Ph.D.
University of Nebraska-Lincoln, 1995
Research Interests: Food Microbiology and Food Safety

Associate Faculty

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