# Agricultural and Biosystems Engineering

Department Information

- **Acting Department Chair:**
  Ken Hellevang, Ph.D.
- **Graduate Coordinator:**
  Shafiqur Rahman, Ph.D.
- **Department Location:**
  Agricultural and Biosystems Engineering Building
- **Department Phone:**
  (701) 231-7261
- **Department Web Site:**
  www.ndsu.edu/aben/
- **Application Deadline:**
  International applications are due May 1st for fall and August 1 for spring. Domestic applications must be received at least one month prior to the start of the semester.
- **Credential Offered:**
  Ph.D., M.S.
- **English Proficiency Requirements:**
  TOEFL iBT 79; IELTS 6.5

## Program Description

The Department of Agricultural and Biosystems Engineering offers graduate study leading to M.S. and Ph.D. degrees. The program emphasizes solving engineering problems for agricultural production, food and biofuels processing, and environmental resources management. Advanced work may involve specialized training in the following areas: irrigation and drainage engineering; agricultural hydrology; soil and water resources management; livestock waste management; air quality, process engineering for food and biofuels, and other bioproducts; agricultural machine systems; precision agriculture; machine vision and intelligent sensors for biological systems; and post-harvest handling and storage of biomass feedstocks and other biological materials.

Student research and academic programs are tailored to individual student needs and interests. Interdisciplinary approaches to agricultural and biosystems engineering programs are fostered.

The Department of Agricultural and Biosystems Engineering graduate program is open to all qualified graduates of universities and colleges of recognized standing. To be admitted with full standing to the program, the applicant must meet the Graduate School's admission requirements and have a baccalaureate degree in engineering or have taken the equivalent of the basic undergraduate engineering courses.

Any student receiving an M.S. or Ph.D. degree from the NDSU ABEN department must have taken the following fundamental courses prior to attaining the graduate degree. If the courses (or their equivalent) were not taken prior to matriculating at NDSU, they should be taken in addition to other coursework required for the graduate degree.

- Mathematics through Differential Equations (NDSU: MATH 266 Introduction to Differential Equations)
- Statics (NDSU: ME 221 Engineering Mechanics I) and Dynamics (NDSU: ME 222 Engineering Mechanics II); these two may be substituted by a calculus-based Physics I class
- Thermodynamics (NDSU: ME 350 Thermodynamics and Heat Transfer); may be substituted with ABEN 644 Transport Processes, which may also count toward graduate degree
- Fluid Mechanics (NDSU: CE 309 Fluid Mechanics or ME 352 Fluid Dynamics)
- Physics II/Electricity and Magnetism (NDSU: PHYS 252 University Physics II)

## Financial Assistance

Research assistantships are available and dependent on the grant funding of faculty research programs. Applicants are considered on the basis of scholarship and potential to undertake advanced study and research. Students must be accepted into the Graduate School before they are eligible for an assistantship.

## M.S. Degree

The M.S. degree program requires completion of 30 semester credit hours beyond the baccalaureate degree as detailed below. A Plan of Study (PoS) should be developed with the adviser by the end of the first semester of work. An oral examination covering the research-based paper or thesis and the

student's understanding and ability to apply the subject matter to the research is required. Students typically require two years to complete their MS degree. An overall GPA of 3.0 or higher must be maintained.

The ABEN M.S. program requirements are:

| Code | Title | Credits |
|---|---|---|
| **Didactic Course Work (601-689, 691; 700-789, 791; 800-889 and 891)** | | 16 |
| ABEN 790 | Graduate Seminar | |
| Additional Credits (as needed to complete 30 total credits) | | |
| ABEN 798 | | 6-10 |
| **Total Credits Required** | | 30 |

* Minimum of 6 credits of NDSU ABEN courses numbered 601-689, 691; 700-789, 791

- 30 credits after the B.S.
- 20-24 credit hours are from course work, while 6-10 credit hours are typically provided for a master's thesis
- A minimum of 6 credits of NDSU ABEN courses numbered 601-689 and 700-789 is required
- ABEN Graduate Seminar (ABEN 790)

## Ph.D. Degree

Ph.D. candidates are encouraged to indicate their research interests when applying for admission and to select an adviser before entering the program. Typically, 3-4 years are required to complete the Ph.D. program after the completion of an M.S. degree.

The degree requirements are in accordance with the NDSU Graduate School requirements. The student's academic adviser will usually be selected during the acceptance process. Prior to the end of the first academic year, the student and academic adviser will arrange for appointment of a Graduate Advisory Committee.

The student and major adviser will prepare a Plan of Study by the end of the first year in residence. The student's Graduate Advisory Committee, the ABEN Department Chair, and the Dean of the Graduate School shall approve the Plan of Study. The Plan of Study (PoS) must be filed in the Graduate School of NDSU. An overall GPA of 3.0 or above must be maintained.

The ABEN Ph.D. program requirements are:

| Code | Title | Credits |
|---|---|---|
| **Didactic credit (601-689, 691; 700-789, 791; 800-889 and 891)*** | | 27 |
| **ABEN 899 and ABEN 790** | | 30-45 |
| **Additional Credits (as need to complete 60 credits (post-master's) or 90 credits (post-bachelor's)** | | |
| **Total credits** | | 60-90 |

* at least 15 credits of which must be 700-800 level and a minimum of 9 credits must be ABEN courses.

- 60 credits after the M.S. or 90 credits after the B.S.
- A minimum of 27 credits from NDSU courses numbered 601-689 and 700-789, at least 15 credits of which must be numbered 700-789
- A minimum of 30 credits of NDSU ABEN dissertation and graduate seminar after the M.S. or 45 credits after the B.S.
- A minimum of 9 credits of NDSU ABEN courses numbered 601-689 or 700-789, 15 credits if entering with other than an ABEN B.S.
- ABEN Graduate Seminar (ABEN 790)
- It is expected that one or more journal articles will be submitted for publication prior to the award of the degree.

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*Any student receiving an M.S. or Ph.D. degree from the NDSU ABEN department must have taken the following fundamental courses prior to attaining the graduate degree. If the courses (or their equivalent) were not taken prior to matriculating at NDSU, they should be taken in addition to other coursework required for the graduate degree.

- Differential Equations (NDSU: Math 266)
- Statics (NDSU: ME 221) and Dynamics (NDSU: ME 222); these two may be substituted by a calculus-based Physics I class
- Thermodynamics (NDSU: ME 350); may be substituted with ABEN 644 which may also count toward graduate degree
- Fluid Mechanics (NDSU: CE 309 or ME 352)
- Physics II/Electricity and Magnetism (NDSU: PHYS 252)

The major adviser may appeal to the ABEN Graduate Committee (not the student's graduate advisory committee) for substitutions or waivers of these requirements.

## *Examinations*

**Comprehensive Examinations:** Both a written and an oral examination will be taken after completion of the greater portion of the course work phase of the Ph.D. program. The written examination will be conducted to test the student's understanding and ability to apply the subject matter related to the chosen research area(s). The format and sequence of the written and oral examinations are dependent on the academic adviser and the examining committee. The examination will be graded pass, fail or marginal pass. If the student does not pass the written component of the comprehensive examination, the student will be provided another opportunity to pass the examination. If the student does not pass the written examination second time, the student must wait one semester before taking the examination for the third time. Failure of the third attempt will prevent the student from proceeding further in the Ph.D. program.

The oral examination will also be coordinated by the academic adviser. In this examination, the student will be required to provide a short presentation of the research progress to the date of the oral examination. The format of the examination is dependent on the academic adviser and the examining committee. This examination is to assess the student's ability to communicate his/her research problem, and how he/she is applying scientific and engineering principles to solve the research problem. This examination may be used by the committee to further ascertain the student's level of understanding of subject matter as observed from the written examination. This examination is graded pass or fail. If a student fails the oral examination, the student will be advised of the deficiencies and will be given a second opportunity to pass the examination. Should both attempts to pass an examination result in failure, the candidate may request to take the examination a third time. A request for a third examination requires the support of the supervisory committee, the Department Chair, and the Dean of the Graduate School after consultation with the Graduate Council. Failure of the third attempt will prevent the student from proceeding further in the Ph.D. program.

Successful completion of both written and oral examinations will formally admit the student into candidacy for the Ph.D. in Agricultural and Biosystems Engineering. At least one semester must elapse between admission to candidacy and final PhD. oral examination of the dissertation.

**Final Examination:** After the research work is completed, the student will write a Ph.D. dissertation following the guidelines of the Graduate School. The final oral PhD. examination will be arranged after the approval of his/her academic adviser. The complete Ph.D. dissertation will be distributed to the examining committee members a minimum of one week before the final examination. The student will present the complete research work during this final examination. After passing the final examination, the student will complete all the appropriate suggested changes of the committee. The student will follow the procedures as defined by the Graduate School to complete the submission of the Ph.D. dissertation.

**Thomas Bon, Ph.D.**
North Dakota State University, 2003
Research Interests: Machine Systems, Electronics and Instrumentation

**Igathinathane Cannayen, Ph.D.**
Indian Institute of Technology, 1997
Research Interests: Biomass Harvest, Storage, Collection and Pre-Processing

**Joao Paulo Flores, Ph.D.**
Federal University of Rio Grande do Sul
Research Interests: Precision Agriculture, Applications of Uass/Drones in Agriculture, Uass/Drone Imagery Analysis, GIS Applications for Precision Agriculture

**Kenneth J. Hellevang, Ph.D.**
North Dakota State University, 1989
Research Interests: Post Harvest Technology, Structures

**Xinhua Jia, Ph.D.**
University of Arizona, 2004
Research Interests: Soil and Water Engineering, Hydrology

**Zhulu Lin, Ph.D.**
University of Georgia, 2003
Research Interests: Water and Soil Resources, Environmental Modeling

**Nurun Nahar, Ph.D.**
North Dakota State University, 2017
Research Interests: Biofuel Production from Cellulosic Feedstocks, Biomass Conversion, Biobased Chemicals and Materials, Process Optimization

**Shafiqur Rahman, Ph.D.**
University of Manitoba, 2004
Research Interests: Livestock Waste Management. Water Quality and Air Quality Assessment and Mitigation, Dust and Particulate Matter Emission

**Thomas S. Scherer, Ph.D.**
University of Minnesota, 1986
Research Interests: Soil and Water Resources Management, Irrigation Systems

**Halis Simsek, Ph.D.**
North Dakota State University, 2012
Research Interests: Water and Wastewater Treatment, Animal and Agricultural Waste Management

**Dean D. Steele, Ph.D.**
University of Minnesota, 1991
Research Interests: Irrigation and Environmental Engineering

**Xin (Rex) Sun, Ph.D.**
Nanjing Agricultural University, 2013
Research Interests: Precision Agriculture, Artificial Intelligence in Food and Agriculture, Precision Livestock Production, Meat Quality Non-destructive Detection Methods