

## **AGRICULTURAL and BIOSYSTEMS ENGINEERING**

The agricultural and biosystems engineering (ABEN) program prepares students for careers in:

- Machine Systems
- Processing Systems for food, biofuels, and other biproducts
- Natural Resources and Environmental Systems

Graduates design systems and solve problems requiring mathematics and the application of physical, biological, and engineering sciences involving biological systems. Agricultural and biosystems engineers address society's grand challenges in food, energy, and water.

### **The Program**

Agricultural and biosystems engineers are uniquely qualified to use their knowledge of mathematics, biological and physical sciences, and engineering principles to solve problems relating to the production, handling and processing of biological materials for food, feed, fiber and fuel; the preservation of natural resources and environment quality; and the design and production of machine systems. A major in agricultural and biosystems engineering can serve a broad range of career interests and can provide excellent career opportunities for men and women from diverse backgrounds.

The Bachelor of Science degree in Agricultural and Biosystems Engineering is accredited by the Engineering Accreditation Commission of ABET, [www.abet.org](http://www.abet.org). Agricultural and biosystems engineering students are well qualified for and encouraged to take the national Fundamentals of Engineering examination. This is the first step in the process of registration as a professional engineer.

Agricultural and biosystems engineering integrates engineering topics, engineering design, and biological sciences in a single program with two concentrations: agricultural engineering and biosystems engineering.

### **Internships**

Although not required by the curriculum, students are strongly encouraged to take advantage of co-operative education experiences (paid internships). These experiences allow students to spend a summer or, more typically, a summer and a semester doing engineering work for an employer of program graduates. Students gain hands-on experience in engineering for the first time. This experience allows students to make an informed decision on their major, to make better selections of elective courses, and to open doors for employment upon graduation.

### **Career Opportunities**

Position titles of graduates for both concentrations may include design engineer, test engineer, project engineer, plant engineer, quality control engineer, process engineer, energy adviser, consulting engineer and environmental engineer. Starting salaries are among the highest paid for college graduates and are comparable to those in other fields of engineering. Recent starting salaries range from \$55,000 to \$75,000 per year with an average of \$60,000 per year. Placement of graduates has been at or near 100 percent for many years.

### **Biosystems Engineering Concentration**

Graduates in biosystems engineering integrate engineering, biology and chemistry in a variety of applications. Graduates may work in careers with the following goals: develop innovative green products and industries; convert bio-based resources to food, fuel and other renewable products; design new generations of devices or systems for biological systems; and control biological systems for natural resource protection, waste remediation and ecosystem restoration. Graduates may work with industries to create new and improved processes through the innovative use of microorganisms, plant and animal cells and enzymes, or they may develop sensors, control systems and computer models to monitor and control biological processes occurring in industry or the environment. Graduates with a biosystems engineering concentration may also pursue a professional or graduate degree in a number of fields including engineering, medicine, veterinary medicine, management or law.

### **Agricultural Engineering Concentration**

Career opportunities for graduates in agricultural engineering are many and diverse. Graduates may work for companies and agencies that design, develop, test and manufacture agricultural power and machine systems; handle, store, process and enhance or protect the quality of agricultural commodities and processed products; design environment control and housing systems for plant and animal production; design equipment and systems for processing, manufacturing, distribution and quality protection of food products; manage air, land and water resources; design and manage crop irrigation systems; and develop electrical and electronic applications for agricultural problems. Graduates with an agricultural engineering concentration may also pursue graduate degrees in areas such as engineering, business or law.

### **Scholarships**

A number of departmental and College of Engineering scholarships are competitively awarded to students in the ABEN program each spring. These scholarships range in value from about \$500 to \$4,000. Scholastic achievement, financial need and extracurricular activities are considered. Scholarships are provided by industry, faculty and alumni. The department provides an opportunity to apply for these scholarships early in spring semester.

### **Extra-Curricular Activities**

Varied extra-curricular programs are available to students majoring in agricultural and biosystems engineering. One professional student organization is the North Dakota Student Engineering Branch of the American Society of Agricultural and Biological Engineers (ASABE), the society for engineering in agricultural, food and biological systems. The honorary societies are Alpha Epsilon (agricultural and biosystems engineering), Tau Beta Pi (engineering) and Phi Kappa Phi (general university). Members of the Student Engineering Branch of ASABE take an active part in the annual Agricultural Technology Exposition, interact with speakers, go on field trips, participate in departmental picnics, compete in the annual AEM Report national competition, compete in the international quarter-scale tractor pull and design competition, and are involved in public service and social activities.

## A Well-Equipped Teaching Facility

The agricultural and biosystems engineering department is housed in its own building. Laboratories are furnished with equipment typically used in industry and research, such as personal computers that are networked to the University's computing facilities and to the Internet, ANSYS, ProE and AutoCAD software, data acquisition systems, biomaterials handling and processing equipment, environmental measurement equipment, controllers, and analog and digital test equipment. The ABEN building is also home to the Bio-Imaging and Sensing Center. This is a state-of-the-art lab with imaging and sensing equipment to solve multidisciplinary problems associated with biological systems. The department also occupies the North Dakota State University Pilot Plant with facilities and equipment for producing and analyzing biofuels, food products and other renewable products. ABEN class size is usually fewer than 25 students, which allows for close faculty-student interaction.

## Agricultural and Biosystems Engineering Plan of Study - Biosystems Option - visit [ndsu.edu/bulletin](http://ndsu.edu/bulletin)

### Agricultural and Biosystems Engineering Plan of Study - Agricultural Option

Please note this is a sample plan of study; actual student schedules will vary depending on start year, individual goals, applicable transfer credit, and course availability. Students are encouraged to work with their academic advisor on a regular basis to review degree progress and customize their own plan of study.

<b>Freshman</b>			
<b>Fall</b>	<b>Credits</b>	<b>Spring</b>	<b>Credits</b>
ABEN 110 Introduction to Agricultural and Biosystems Engineering	3	ABEN 496 Field Experience (Ag Tech Expo)	1
CHEM 121 General Chemistry I	3	ME 212 Fundamentals of Visual Communication for Engineers	3
ENGL 110 College Composition I	4	ME 221 Engineering Mechanics I	3
MATH 165 Calculus I	4	CHEM 122 General Chemistry II	3
CHEM/BIO Elective	3	ENGL 120 College Composition II	3
		MATH 166 Calculus II	4
	<b>17</b>		<b>17</b>
<b>Sophomore</b>			
<b>Fall</b>	<b>Credits</b>	<b>Spring</b>	<b>Credits</b>
ABEN 255 Computer Aided Analysis and Design	3	ABEN 263 Biological Materials Processing	3
COMM 110 Fundamentals of Public Speaking	3	PHYS 252 University Physics II	4
ME 222 Engineering Mechanics II	3	PHYS 252L University Physics II Laboratory	1
ME 223 Mechanics of Materials	3	MATH 266 Introduction to Differential Equations	3
MATH 259 Multivariate Calculus	3	ME 350 Thermodynamics and Heat Transfer	3
MATH 128 Introduction to Linear Algebra	1	Computer Elective	3
Gen Ed Elective	2		
	<b>18</b>		<b>17</b>
<b>Junior</b>			
<b>Fall</b>	<b>Credits</b>	<b>Spring</b>	<b>Credits</b>
IME 460 Evaluation of Engineering Data	3	ABEN 377 Numerical Modeling in Agricultural and Biosystems Engineering	3
CE 309 Fluid Mechanics	3	ABEN 482 Instrumentation and Measurements	3
ENGL 321, 324, or 459 Writing in the Technical Professions or Writing in the Sciences or Researching and Writing Grants and Proposal	3	ECE 301 Electrical Engineering I	3
ENGR 402 Engineering Ethics and Social Responsibility	1	ABEN Elective	3
ABEN Elective	3	Gen Ed Elective	3
CHEM/BIO Elective	3		
	<b>16</b>		<b>15</b>
<b>Senior</b>			
<b>Fall</b>	<b>Credits</b>	<b>Spring</b>	<b>Credits</b>
ABEN 486 Design Project I	2	ABEN 487 Design Project II	2
ABEN 491 Seminar	1	Tech Elective	3
IME 440 Engineering Economy	2	CHEM/BIO Elective	3
ABEN Elective	3	Gen Ed Elective	3
Gen Ed Elective	3	Gen Ed Elective	3
Tech Elective	5	BUS/COMM Elective	3
	<b>16</b>		<b>17</b>
<b>Total Credits: 133</b>			

View NDSU equivalencies of transfer courses at: [www.ndsu.edu/transfer/equivalencies](http://www.ndsu.edu/transfer/equivalencies)

### For Further Information

Department of Agricultural and Biosystems Engineering  
North Dakota State University  
Agricultural and Biosystems Engineering 100  
Dept #7620  
PO Box 6050  
Fargo, ND 58108-6050

Phone: (701) 231-7261  
Fax: (701) 231-1008  
Email: [ndsu.aben@ndsu.edu](mailto:ndsu.aben@ndsu.edu)  
Web: [www.ndsu.edu/aben/](http://www.ndsu.edu/aben/)

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