AGRICULTURAL and BIOSYSTEMS ENGINEERING

The agricultural and biosystems engineering (ABEN) program prepares men and women for careers requiring application of physical, biological and engineering sciences to problems that involve living systems. Agricultural and biosystems engineers provide engineering for the necessities of life.

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 program is accredited by the Engineering Accreditation Commission of ABET, 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.

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 at graduation.

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 $1,500. Scholarly 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, Pro-E and AutoCAD software, data acquisition systems, biocomposites 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.

Sample Curriculum

General Education

First Year Experience

ABEN 189 - Skills for Academic Success ............................ 1

Communication

COMM 110 - Fundamentals of Public Speaking .................. 3
ENGL 110, 120 - College Composition I, II ...................... 6
English Upper Level Writing Course ................................. 3

Quantitative Reasoning

MATH 165 - Calculus I ........................................... 4

Science & Technology

CHEM 121 - General Chemistry I ................................. 3
CHEM 122 - General Chemistry II ................................. 3
PHYS 252, 252L - University Physics II, Lab .................. 4, 1

Humanities & Fine Arts ................................................ 6

Social & Behavioral Sciences ......................................... 6
Wellness ........................................................................... 2

Cultural Diversity ................................................................

Global Perspective .......................................................... 1

Total .............................................................................. 40

Major Requirements (Both Concentrations)

ABEN 110 - Intro to Agricultural and Biosystems Engineering .... 2
ABEN 255 - Computer Aided Analysis and Design ............... 3
ABEN 263 - Biological Materials Processing .................... 3
ABEN 482 - Instrumentation and Measurements ................ 3
ABEN 486, 487 - Design Project I, II .............................. 2, 2
ABEN 491 - Seminar .................................................... 1
ABEN 496 - Field Experience ........................................ 1
CE 309, 310 - Fluid Mechanics and Lab ......................... 4
ECE 301 - Electrical Engineering I .................................. 3
ENGR 402 - Engineering Ethics and Social Responsibility .... 1
IME 440 - Engineering Economy .................................... 2
IME 460 - Evaluation of Engineering Data or
STAT 330 - Introductory Statistics .................................. 3
MATH 128 - Introduction to Linear Algebra ...................... 1
MATH 166 - Calculus II .............................................. 4
MATH 259 - Multivariate Calculus .................................. 3
MATH 266 - Introduction to Differential Equations .............. 3
ME 221 - Engineering Mechanics I ............................... 3
ME 222 - Engineering Mechanics II ................................ 3
ME 350 - Thermodynamics and Heat Transfer ................. 3

Total .............................................................................. 46

Agricultural Engineering Requirements

Credits

ABEN 377 - Modeling in ABEN ...................................... 3
CE 310 - Fluid Mechanics Lab ........................................ 1
ECE 301 - Electrical Engineering I ................................. 3
ME 212 - Fundamentals of Visual Communication for Engineers .............................................. 3
ME 223 - Mechanics of Materials .................................. 3
ABEN Electives .................................................................. 3
Business or Communication Elective ............................... 3
Chemistry or Biology Electives ........................................ 9
Computer Elective .......................................................... 3
Technology Electives ...................................................... 8

Total .............................................................................. 45

Biosystems Engineering Requirements

Credits

ABEN 444 - Transport Processes .................................... 3
BIOL 150 - General Biology I ........................................ 3
CHEM 121L, 122L - General Chemistry Lab I and II ........ 1, 1
CHEM 240 - Survey of Organic Chemistry ...................... 3
ABEN Electives .................................................................. 9
Chemistry or Biology Electives ........................................ 6
Computer Elective .......................................................... 3
Engineering Electives ...................................................... 9
Technology Electives ...................................................... 7

Total .............................................................................. 45

Curriculum Total .......................................................... 133

This sample curriculum is not intended to serve as a curriculum guide for current students, but rather an example of course offerings for prospective students. For the curriculum requirements in effect at the time of entrance into a program, consult with an academic advisor or with the Office of Registration and Records.

For Further Information

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