

Agricultural & Biosystems Engineering - Biosystems Option

Agricultural and Biosystems Engineering Major

The Agricultural and Biosystems Engineering (ABEN) program prepares men and women for careers requiring application of physical, biological, and engineering sciences to develop solutions relating to: the design and production of machine systems; the production and handling of biological materials; processing of food, feed, fiber, and fuel; and the preservation of natural resources and environmental quality. 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 educational objectives of this major are to educate and produce graduates who will become engineers who:

1. have the ability to use their technical knowledge and design and problem solving skills throughout their careers,
2. have the interpersonal and collaborative skills and the capacity necessary for productive careers, and
3. can use their disciplinary knowledge and educational depth and breadth to deal with changing career opportunities in agricultural and related industries.

These objectives support the department mission of developing and extending knowledge through engineering and technology that advances the productivity of agricultural production, the processing and utilization of biological materials, and the management of environmental resources.

Agricultural and biosystems engineering integrates engineering topics, engineering design, and biological sciences in a single program with two concentrations: agricultural engineering and biosystems engineering. While there is considerable overlap between the agricultural engineering (AGEN) and the biosystems engineering (BSEN) concentrations, the BSEN concentration includes a heavier emphasis on fundamental biological and chemical sciences. The AGEN concentration includes a heavier emphasis in the physical sciences. A wide range of electives in related disciplines can be used to compliment the disciplinary course work and to prepare for specific career interests. Although not required by the curriculum, students are encouraged to take advantage of Cooperative Education experiences or the opportunity of paid internships where they gain hands-on experience in engineering.

Biosystems Engineering Option

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 engineering, medicine, veterinary medicine, management, or law.

The faculty assist with career planning and job placement of graduates. Students interested in careers involving production, delivery, management, and technical support of systems for food, agricultural, or closely related industries rather than engineering or design should consider the Agricultural Systems Management major (<http://bulletin.ndsu.edu/past-bulletin-archive/2015-16/undergraduate/colleges/agriculture-food-systems-natural-resources/agriculture-biosystems-engineering/agricultural-systems-management>) offered by the College of Agriculture, Food Systems, and Natural Resources (<http://www.ag.ndsu.edu/academics>).

Major Requirements

Major: Agricultural & Biosystems Engineering Option: Biosystems Engineering

Degree Type: B.S.A.B.En

Required Degree Credits to Graduate: 133

General Education Requirements

First Year Experience (F):

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| ABEN 189 | Skills for Academic Success (Students transferring in 24 or more credits do not need to take ABEN 189.) | 1 |
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Communication (C):

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| ENGL 110 | College Composition I | 3 |
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| ENGL 120 | College Composition II | 3 |
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| One course in Upper Level Writing. Select one of the following: | | 3 |
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| ENGL 321 | Writing in the Technical Professions | |
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| ENGL 324 | Writing in the Sciences | |
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| ENGL 459 | Researching and Writing Grants and Proposal | |
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| COMM 110 | Fundamentals of Public Speaking | 3 |
| Quantitative Reasoning (R): | | |
| MATH 165 | Calculus I | 4 |
| Science & Technology (S): | | |
| CHEM 121 & 121L | General Chemistry I and General Chemistry I Laboratory | 4 |
| CHEM 122L | General Chemistry II Laboratory | 1 |
| PHYS 252 & 252L | University Physics II and University Physics II Laboratory | 5 |
| Humanities & Fine Arts (A): Select from current general education list | | 6 |
| Social & Behavioral Sciences (B): Select from current general education list | | 6 |
| Wellness (W): Select from current general education list | | 2 |
| Cultural Diversity (D): Select from current general education list | | |
| Global Perspectives (G): Select from current general education list | | |
| Total Credits | | 41 |

Major Requirements - Biosystems Option

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| General Education Requirements | | 40 |
| ABEN Core Requirements: | | |
| ABEN 110 | Introduction to Agricultural and Biosystems Engineering | 2 |
| ABEN 255 | Computer Aided Analysis & Design | 3 |
| ABEN 263 | Biological Materials Processing | 3 |
| ABEN 444 | Transport Processes | 3 |
| ABEN 482 | Instrumentation & Measurements | 3 |
| ABEN 486 | Design Project I | 2 |
| ABEN 487 | Design Project II | 2 |
| ABEN 491 | Seminar | 1 |
| ABEN 496 | Field Experience | 1 |
| ABEN 300-400 Electives: Select 9 credits from the following: | | 9 |
| ABEN 358 | Electric Energy Application in Agriculture | |
| ABEN 377 | Numerical Modeling in Agricultural and Biosystems Engineering | |
| ABEN 450 | Bioprocess Engineering | |
| ABEN 452 | Bioenvironmental Systems Design | |
| ABEN 456 | Biobased Energy | |
| ABEN 458 | Process Engineering for Food, Biofuels and Bioproducts | |
| ABEN 464 | Resource Conservation and Irrigation Engineering | |
| ABEN 473 | Agricultural Power | |
| ABEN 478 | Machinery Analysis & Design | |
| ABEN/ME 479 | Fluid Power Systems Design | |
| ABEN 484 | Drainage and Wetland Engineering | |
| MATH Courses: | | |
| 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 Courses: | | |
| ME 221 | Engineering Mechanics I | 3 |
| ME 222 | Engineering Mechanics II | 3 |
| ME 350 | Thermodynamics and Heat Transfer | 3 |
| Additional Courses: | | |
| BIOL 150 | General Biology I | 3 |
| CHEM 122 | General Chemistry II | 3 |

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| CHEM 240 | Survey of Organic Chemistry | 3 |
| CE 309 | Fluid Mechanics | 3 |
| ENGR 402 | Engineering Ethics and Social Responsibility | 1 |
| IME 440 | Engineering Economy | 2 |
| IME 460 | Evaluation of Engineering Data | 3 |
| or STAT 330 | Introductory Statistics | |
| Program Electives | The following program electives may be selected from courses listed in the Program Electives Tab. | |
| Engineering Electives | Select a minimum of 9 credits from the Program Electives Tab. | 9 |
| Chemistry/Biological Science Electives | Select a minimum of 6 credits from the Program Electives Tab. | 6 |
| Technical Electives | Select elective courses from the Program Electives Tab. | 7 |
| Computer Elective | Select a minimum of 3 credits from the Program Electives Tab. | 3 |
| Total Credits | | 133 |

Degree Requirements and Notes

A student must complete at least 60 semester credits of professional level course work in his/her program while in residence and enrolled in the college.

Students transferring into the college from programs with professional accreditation are exempt from this residency requirement but are subject to the residency requirement of NDSU.

Program Electives for ABEN:

Biosystems Option - Program Electives

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| Engineering Electives: Select 9 credits from the following: | | 9 |
| CE 310 | Fluid Mechanics Laboratory | |
| CE 370 | Introduction to Environmental Engineering | |
| CE 371 | Environmental Engineering Laboratory | |
| ECE 301 | Electrical Engineering I | |
| ME 223 | Mechanics of Materials | |
| ME 331 | Materials Science and Engineering | |
| Chemistry/Biological Science Electives: Select 6 credits from the following: | | 6 |
| ANSC 357 | Animal Genetics | |
| ANSC 463 | Physiology of Reproduction | |
| BIOC 460 | Foundations of Biochemistry and Molecular Biology I | |
| BIOC 461 | Foundations of Biochemistry and Molecular Biology II | |
| BIOL 150L | General Biology I Laboratory | |
| BIOL 151 | General Biology II | |
| BIOL 151L | General Biology II Laboratory | |
| BIOL 220 | Human Anatomy and Physiology I | |
| BIOL 315 | Genetics | |
| BIOL 315L | Genetics Laboratory | |
| BIOL 364 | General Ecology | |
| BOT 314 | Plant Systematics | |
| BOT 380 | Plant Physiology | |
| BOT 460 | Plant Ecology | |
| CHEM 260 | Elements of Biochemistry | |
| CHEM 341 | Organic Chemistry I | |
| CHEM 341L | Organic Chemistry I Laboratory | |
| CHEM 342 | Organic Chemistry II | |
| CHEM 342L | Organic Chemistry II Laboratory | |
| MICR 202 | Introductory Microbiology | |
| MICR 202L | Introductory Microbiology Lab | |
| MICR 350 | General Microbiology | |
| MICR 350L | General Microbiology Lab | |

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| MICR 352 | General Microbiology II | |
| MICR 352L | General Microbiology Lab II | |
| MICR 452 | Microbial Ecology | |
| ZOO 370 | Cell Biology | |
| Technical Electives: Select 7 credits from the following or from additional courses: | | 7 |
| BIOC 473 | Methods of Biochemical Research | |
| BIOC 474 | Methods of Recombinant DNA Technology | |
| CFS 210 | Introduction to Food Science and Technology | |
| CFS 370 | Food Processing I | |
| CFS 450 | Cereal Technology | |
| Computer Elective: Select 3 credits from the following: | | 3 |
| CE 212 | Civil Engineering Graphic Communications | |
| CSCI 122 | Visual BASIC | |
| CSCI 160 | Computer Science I | |
| ECE 173 | Introduction to Computing | |
| GEOG 455 | Introduction to Geographic Information Systems | |
| IME 380 | CAD/CAM for Manufacturing | |
| ME 212 | Fundamentals of Visual Communication for Engineers | |
| ME 213 | Modeling of Engineering Systems | |
| Total Credits | | 25 |