

Agricultural and Biosystems Engineering

Department Information

- **Department Web Site:**
www.ndsu.edu/aben/ (<http://www.ndsu.edu/aben/>)
- **Credential Offered:**
B.S.A.B.En.
- **Sample Program Guide:**
catalog.ndsu.edu/programs-study/undergraduate/agricultural-biosystems-engineering/ (<http://catalog.ndsu.edu/programs-study/undergraduate/agricultural-biosystems-engineering/>)

Major Requirements

Major: Agricultural & Biosystems Engineering Option: Agricultural

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

Minimum Degree Credits to Graduate: 131

University Degree Requirements

1. Satisfactory completion of all requirements of the curriculum in which one is enrolled.
2. Earn a minimum total of 120 credits in approved coursework. Some academic programs exceed this minimum.
3. Satisfactory completion of the general education requirements as specified by the university.
4. A minimum institutional GPA of 2.00 based on work taken at NDSU.
5. At least 30 credits must be NDSU resident credits. Resident credits include credits registered and paid for at NDSU.
6. At least 36 credits presented for graduation must be in courses numbered 300 or higher.
7. Students presenting transfer credit must meet the NDSU residence credits and the minimum upper level credit. Of the 30 credits earned in residence, a minimum of 15 semester credits must be in courses numbered 300 or above, and 15 semester credits must be in the student's curricula for their declared major.

For complete information, please refer to the Degree and Graduation Requirements (<http://catalog.ndsu.edu/past-bulletin-archive/2023-24/academic-policies/undergraduate-policies/degree-and-graduation/>) section of this Bulletin.

University General Education Requirements

Code	Title	Credits
Communication (C)		12
ENGL 110	College Composition I	
ENGL 120	College Composition II	
COMM 110	Fundamentals of Public Speaking	
Upper Division Writing [†]		
Quantitative Reasoning (R) [†]		3
Science and Technology (S) [†]		10
Humanities and Fine Arts (A) [†]		6
Social and Behavioral Sciences (B) [†]		6
Wellness (W) [†]		2
Cultural Diversity (D) ^{**†}		
Global Perspectives (G) ^{**†}		
Total Credits		39

* May be satisfied by completing courses in another General Education category.

† General education courses may be used to satisfy requirements for both general education and the major, minor, and program emphases, where applicable. Students should carefully review major requirements to determine if specific courses can also satisfy these general education categories.

- A list of university approved general education courses and administrative policies are available here (<http://catalog.ndsu.edu/past-bulletin-archive/2023-24/academic-policies/undergraduate-policies/general-education/#genedcoursestext>).

ABEN Core Requirements

Code	Title	Credits
ABEN 110	Introduction to Agricultural and Biosystems Engineering	3
ABEN 255	Computer Aided Analysis & Design	3
ABEN 263	Biological Materials Processing	3
ABEN 348	Agricultural Technology Exposition	1
ABEN 391	Seminar	1
ABEN 482	Instrumentation & Measurements	3
ABEN 486	Design Project I	2
ABEN 487	Design Project II	2
CHEM 121	General Chemistry I	3
CHEM 122	General Chemistry II	3
CE 309	Fluid Mechanics	3
ENGR 327	Ethics, Engineering, and Technology	3
IME 440	Engineering Economy	2-3
IME 460	Evaluation of Engineering Data	3
MATH 128	Introduction to Linear Algebra	1
MATH 165	Calculus I	4
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
PHYS 252 & 252L	University Physics II and University Physics II Laboratory	5
Major Option		
Select one option to complete the major: Option A - Agriculture or Option B - Biosystems		44-50
Total Credits		108-115

Option A - Agriculture

Code	Title	Credits
ABEN 358	Electric Energy Application in Agriculture	3
ABEN 377	Numerical Modeling in Agricultural and Biosystems Engineering	3
ME 212	Fundamentals of Visual Communication for Engineers	3
ME 223	Mechanics of Materials	3
ABEN Elective - Select 9 credits from the following: ^{2,3}		9
ABEN 358	Electric Energy Application in Agriculture	
ABEN 444	Transport Processes	
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 479	Fluid Power Systems Design	
ABEN 484	Drainage and Wetland Engineering	
Business/Comm Elective - Select 3 credits from the following: ⁴		3
ACCT 102	Fundamentals of Accounting	
ACCT 200	Elements of Accounting I	

AGEC 242	Introduction to Agricultural Management	
AGEC 244	Agricultural Marketing	
AGEC 246	Introduction to Agricultural Finance	
COMM 212	Interpersonal Communication	
COMM 214	Persuasive Speaking	
COMM 216	Intercultural Communication	
COMM 260	Introduction to Web Design	
ECON 201	Principles of Microeconomics	
ECON 202	Principles of Macroeconomics	
MGMT 301	Management for Non-Business Majors	
MRKT 301	Marketing for Non-Business Majors	
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 213	Modeling of Engineering Systems	
CHEM/BIO/ENVIRO Electives - Select 9 credits from the following: ³		9
ASM 264	Natural Resource Management Systems	
ANSC 220	Livestock Production	
BIOL 111	Concepts of Biology	
BIOL 111L	Concepts of Biology Lab	
BIOL 124	Environmental Science	
BIOL 124L	Environmental Science Laboratory	
BIOL 150	General Biology I	
BIOL 150L	General Biology I Laboratory	
BIOL 151	General Biology II	
BIOL 151L	General Biology II Laboratory	
CFS 210	Introduction to Food Science and Technology	
CFS 370	Food Processing I	
CFS 450	Cereal Technology	
CHEM 121L	General Chemistry I Laboratory	
CHEM 122L	General Chemistry II Laboratory	
CHEM 240	Survey of Organic Chemistry	
ENT 210	Insects, Humans and the Environment	
MICR 202	Introductory Microbiology	
MICR 202L	Introductory Microbiology Lab	
MICR 350	General Microbiology	
MICR 350L	General Microbiology Lab	
NRM 322	Environmental Law and Policy	
PLSC 110	World Food Crops	
PLSC 215	Weed Identification	
PLSC 225	Principles of Crop Production	
PLSC 315	Genetics	
PLSC 320	Principles of Forage Production	
PLSC 323	Principles of Weed Science	
PLSC 335	Seed Technology & Production	
RNG 225	Natural Resource & Agro-Ecosystems	
SOIL 210	Introduction to Soil Science	
SOIL 217	Introduction to Meteorology & Climatology	

SOIL 410	Soils and Land Use
SOIL 480	Soils and Pollution
Tech Electives - Select 8 credits from the following: ^{1, 2, 3}	
Tech Electives can be selected from any courses previously not taken in the ABEN Electives section, Engineering Electives section, CHEM/BIO/ENVIRO Electives section, or Computer Electives section, or from the following:	
ASM 323	Post-Harvest Technology
ASM 373	Tractors & Power Units
ASM 374	Power Units Laboratory
ASM 378	Machinery Principles and Management
ASM 429	Hydraulic Power Principles and Applications
CE 310	Fluid Mechanics Laboratory
CE 204	Surveying
CE 343	Structural Engineering and Analysis
CE 370	Introduction to Environmental Engineering
CE 371	Environmental Engineering Laboratory
CE 404	Reinforced Concrete
CE 408	Water Resources and Supply
CE 410	Water and Wastewater Engineering
CE 421	Open Channel Flow
CE 451	Advanced Surveying
CE 472	Solid and Hazardous Waste Management
CE 477	Applied Hydrology
CE 478	Water Quality Management
CE 479	Advanced Water and Wastewater Treatment
ECE 275	Digital Design
ECE 301	Electrical Engineering I
ECE 303	Electrical Engineering II
ECE 376	Embedded Systems
ENVE 473	Air Pollution
GEOG 105	Fundamentals of Geographic Information Systems
GEOG 455	Introduction to Geographic Information Systems
GEOG 456	Advanced Geographic Information Systems
IME 330	Manufacturing Processes
IME 335	Welding Technology
IME 380	CAD/CAM for Manufacturing
IME 430	Process Engineering
IME 431	Production Engineering
IME 450	Systems Engineering and Management
IME 455	Management of People Systems
IME 456	Program and Project Management
IME 461	Quality Assurance and Control
ME 331	Materials Science and Engineering
ME 341	Mechanics of Machinery
ME 353	Thermodynamics II
ME 421	Theory of Vibrations
ME 423	Intermediate Mechanics of Materials
ME 442	Machine Design I
ME 454	Heat and Mass Transfer
ME 471	Experimental Stress Analysis
ME 473	Engineering with Polymeric Materials
ME 474	Mechanics of Composite Materials
ME 475	Automatic Controls

ME 487	Internal Combustion Engines	
RNG 326	Modeling of Range and Agro-Ecosystems	
STAT 461	Applied Regression Models	
STAT 462	Introduction to Experimental Design	

Total Credits **44**

Option B - Biosystems

Code	Title	Credits
ABEN 444	Transport Processes	3
BIOL 150	General Biology I	3
CHEM 121 & 121L	General Chemistry I and General Chemistry I Laboratory	4
CHEM 122 & 122L	General Chemistry II and General Chemistry II Laboratory	4
CHEM 240	Survey of Organic Chemistry	3
ABEN Electives - Select 9 credits from the following: ^{2,3}		9
ABEN 358	Electric Energy Application in Agriculture	
ABEN 377	Numerical Modeling in Agricultural and Biosystems 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 479	Fluid Power Systems Design	
ABEN 484	Drainage and Wetland Engineering	
Computer Electives - 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 480	Production and Inventory Control	
ME 212	Fundamentals of Visual Communication for Engineers	
ME 213	Modeling of Engineering Systems	
CHEM/BIO/ENVIRO Electives - Select 6 credits from the following: ³		6
ANSC 357	Animal Genetics	
ANSC 463	Physiology of Reproduction	
BIOC 260	Elements of Biochemistry	
BIOC 461	Foundations of Biochemistry and Molecular Biology II	
BIOC 473	Methods of Biochemical Research	
BIOC 474	Methods of Recombinant DNA Technology	
BIOL 150L	General Biology I Laboratory	
BIOL 151L	General Biology II Laboratory	
BIOL 220	Human Anatomy and Physiology I	
BIOL 315L	Genetics Laboratory	
BIOL 364	General Ecology	
BIOL 370	Cell Biology	
BIOL 461	Plant Ecology	
CFS 210	Introduction to Food Science and Technology	
CFS 370	Food Processing I	
CFS 450	Cereal Technology	

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	
MICR 352	Critical Skills in Microbiology	
MICR 352L	Critical Skills in Microbiology Laboratory Research	
MICR 452	Microbial Ecology	
PLSC 380	Principles of Plant Physiology	
Engineering Electives - Select 9 credits from the following: ³		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	
Tech Electives - Select 6 credits from the following:		6
Tech Electives should be selected from any courses previously not taken in the ABEN Electives section, Engineering Electives section, CHEM/BIO/ENVIRO Electives section, or Computer Electives section. ^{1,2,3}		
Total Credits		50

1

ABEN 348 - AG Tech Exp (1 add'l cr.) may be used as a Technical Elective in either option.

2

ABEN 496 - Field Exp./Internship (1 cr.) may be used as an ABEN Elective or as a Technical Elective. A maximum of two credits of ABEN 496 Field Exp./Internship may be counted towards degree requirements.

3

Advanced bioscience courses may double-count with electives in this category.

4

The course used for this business or communication elective may count as a general education Cultural Diversity or Global Perspective but not as a Humanities/Fine Arts or Social or Behavioral Sciences.

Degree Requirements and Notes

Advanced Bioscience Credits

Code	Title	Credits
Students must select 9 credits of Advanced Bioscience Courses, which are made up of the courses identified below. Advanced bioscience courses should double-count with electives noted in footnote 3. Qualifying courses must have a biological science component with one or more prerequisites. Additional courses may be available in consultation with your advisor.		
Option A		
ABEN 444	Transport Processes	3
ABEN 452	Bioenvironmental Systems Design	3
ABEN 456	Biobased Energy	3
ABEN 458	Process Engineering for Food, Biofuels and Bioproducts	3
ABEN 464	Resource Conservation and Irrigation Engineering	4
ABEN 484	Drainage and Wetland Engineering	3
ANSC 357	Animal Genetics	3
BIOL 364	General Ecology	3
BOT 380	Plant Physiology	3
PLSC 320	Principles of Forage Production	3
PLSC 335	Seed Technology & Production	2

PLSC 350	Sugarbeet Production	2
PLSC 411	Genomics	3
PLSC 431	Intermediate Genetics	3
RNG 452	Managing Natural and Rangeland Resources using GIS	3
SOIL 322	Soil Fertility and Fertilizers	3
SOIL 351	Soil Ecology	3
SOIL 410	Soils and Land Use	3
SOIL 444	Soil Genesis and Survey	3
SOIL 465	Soil And Plant Analysis	3
Option B		
ABEN 444	Transport Processes	3
CHEM 240	Survey of Organic Chemistry	3
Remaining 3 credits may be taken from those identified in Option A.		

SUGGESTED EMPHASIS AREA: Consult with adviser when making selections.

- **Agricultural Systems** - Select electives with emphasis on machine, power, structural, and electrical/electronic systems to solve problems involving engineering aspects of food, feed, and fiber production.
- **Environmental Systems** - Select electives with emphasis on areas that contribute to solving problems in environmental engineering, natural resources management, hydrology, irrigation, watershed management, and waste management.
- **Biomaterial Systems** - Select electives with emphasis on combining engineering, biological, and physical sciences in the application of engineering principles to handling and processing of biomaterials for food and non-food products.

Degree Requirements for the Accelerated M.S. Program in Agricultural and Biosystems Engineering

Students pursuing an accelerated master's degree in ABEN must complete the following requirements:

- 30 credits after the B.S is required. However, a maximum of 15 graduate credits earned during the combined/accelerated degree program may also be counted toward the graduate degree.
- 20-24 credits are from didactic course work, while 6-10 credits are typically devoted for a master's thesis based on research
- A minimum of 6 credits of NDSU ABEN courses numbered 601-689 and 700-789 is required.
- ABEN Graduate Seminar (ABEN 790).