

# College of Agriculture

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Patricia A. Jensen, Dean

Agriculture provided the foundation upon which this institution was established in 1890. Its primary mission, to serve the people, has not changed over the years and the achievements by the faculty in teaching, research, extension, and service provide testimony to its success as a land-grant institution.

The demand for graduates with expertise in agricultural disciplines continues to grow. Career opportunities for men or women with rural and urban backgrounds are rapidly expanding in the agricultural industry. The availability of human resources has become a critical issue. Tomorrow's graduates in agriculture will be the benefactors of today's increasing shortages in human capital.

Faculty in the college are deeply involved in basic and applied research and, as a result, provide students with a unique educational experience utilizing state-of-the-art equipment and laboratory relevant exercises in many programs.

## Degree Programs

At the undergraduate level the College of Agriculture offers a Bachelor of Science degree and a preprofessional program for veterinary school.

The pre-veterinary medicine program does not offer a B.S. degree and students are urged to select an additional major area of study. By following this recommendation, students will complete the requirements to veterinary medical school and earn a Bachelor of Science degree in a related field, such as animal and range sciences, biotechnology, food science, or microbiology. A graduate program is available in agriculture with curricula leading to Master of Science and Doctor of Philosophy degrees. Graduate program information is available in the Graduate Bulletin.

## Degree Requirements

All students enrolled in the College of Agriculture are expected to meet or exceed the following basic requirements before graduating with the Bachelor of Science degree in agriculture.

	<b>Credits</b>
Program Core Requirements . . . . .	24
First-Year Experience . . . . .	1
Written and Oral Communications* . . . . .	12
This includes 9 general education credits from the communication category and 3 credits involving active student participation in writing/speaking.	
Basic and Applied Sciences* . . . . .	20
This includes 10 general education credits from the science and technology category and 3 credits from the quantitative reasoning category.	
Humanities and Fine Arts* . . . . .	6
Social and Behavioral Sciences* . . . . .	6
(A three-discipline minimum is required across 15 credits in the two preceding categories.)	



Wellness* . . . . .	2
Electives . . . . .	42
Curriculum Total . . . . .	128

\*Refer to Courses Approved for General Education Requirements listed in the Appendix.

Candidates for the Bachelor of Science degree must complete a minimum of 128 credits in one of the curricula of the college. They must also meet the requirements of the University. Program core requirements include courses in the major and supporting disciplines and are determined by the major.

## Graduation Status

A graduation status review is available to students each semester through their adviser.

## Honor System

The College of Agriculture recognizes the ability of its students to govern themselves as mature men and women. The Honor System has been functioning in the college since 1955 and provides students with a method of self-government during examinations. All students who are enrolled in agriculture courses are required to uphold the Honor System.

## Scholarships

Students who have declared a major in one of the agriculture disciplines are eligible for scholarships through their major department and the dean's office. Scholarships are awarded to students who have demonstrated excellence in their work, high interest in pursuing a career in agriculture, and involvement in University and community activities.

Several departments offer scholarships having specific requirements and students are encouraged to consult individual departments for details.

## Special Opportunities

Special opportunities available as a supplement or an enhancement to college majors include the following.

### Agribusiness Minor

The 19 credit agribusiness minor supplements a student's technical training in agricultural sciences with an understanding of fundamental business concepts and applies business strategies to agribusiness decision making. The agribusiness minor is restricted to students whose major is in the College of Agriculture, but excluding agricultural economics.

### Agricultural Extension

Persons seeking careers in agricultural extension with the Cooperative Extension Service or similar positions with other agencies may enroll in agricultural education, offered through the College of Human Development and Education.

### Field Experience or Cooperative Education

Students majoring in one of the agricultural disciplines may gain practical experience by enrolling in the field experience courses in their major (195, 495) or through Cooperative Education (Univ 395). Students must enroll for field experience and follow the requirements of the individual department to receive credit. Cooperative Education credits are considered an enrichment experience and may not substitute for academic credits required for graduation.

### ROTC Programs

Up to 18 elective credits may be earned by participation in the Army or Air Force ROTC programs. Men or women may take these programs for elective credit and in addition may complete either program and receive a commission upon graduation. For details of

the ROTC programs and scholarships available see Reserve Officers Training Corps programs under the Special Programs section.

## Agricultural Economics

Agricultural economics applies economic principles to the use of private and public resources to provide a safe and affordable food supply, to maintain a sustainable agricultural and rural resource base, and to manage natural and environmental resources for current and future generations.

As the global population grows and the world's economies become more interdependent, economic principles become increasingly important for problems facing the agribusiness industry. Students interested in careers in agribusiness have several options. Beginning in their sophomore year, students take courses in management, marketing, and finance, all concentrating on the unique aspects of food system economics. Increasing specialization permits students to concentrate in areas of particular interest: agribusiness, agrifinance, commodity marketing, or production and farm management.

Choice of a custom option or involvement in the natural resources management program broadens the options available to students interested in other areas of applied economics. These options allow students to select programs of study consistent with their personal career objectives.

### Curriculum Options

Agricultural economics majors may choose from the following options:

**Agribusiness:** This option provides students with a broad background, preparing them for general career alternatives in agribusiness.

**Agrifinance:** This option prepares students for careers in agribusiness finance, agricultural lending, financial institution management, accounting, insurance, and investment.

**Commodity Marketing:** This option prepares students for careers in agricultural marketing (especially commodity marketing), sales, or product marketing.

### Production and Farm Management:

This option prepares students for both management and technical aspects of farming, ranching, and agribusiness, or for employment in extension, consulting, and government agencies.

**Custom Option:** This option includes programs created to meet unique student interests in areas such as extension, community development, pre-law, public relations, journalism, broadcasting, or computer applications (contact department for details).

**Minor:** Students in other majors may earn a minor in agricultural economics.

## Recommended Curriculum Agricultural Economics

First Year	Credits
AgEc 150, 201, 202, Quant, Micro, Macro	2,3,3
Agri 150, Ag Orientation	1
Agri 189, Skills for Academic Success	1
Comm 110, Fund of Public Speaking	3
CSci 146, Busn Use of Computers	3
Engl 110, 120, College Composition I, II	3,3
Math 103, College Algebra or Math 104, Finite Math	3 3
Ag Science Elective	3
Free Electives	3
Total	31

### Second, Third, and Fourth Years

	Ag- Bus.	Ag. Comm. Fin.	Prod. Mktg.	Prod. Mgt.
Science and Mathematics				
Natural Science	4	4	4	4
Statistics	5	5	5	5
Ag Sciences Electives	6	6	8	12
Business				
Accounting Principles	3	6	3	3
Intermediate Accounting	-	6	-	-
Fin, Mktg, Mgt	6	3	6	3
English and Communication	9	9	9	9
Humanities and Fine Arts	6	6	6	6
Intermediate Economic Theory	6	9	6	6
Wellness	2	2	2	2
Agricultural Economics				
Requirements	24	24	24	24
Category Electives	19	11	16	11
Free Electives	7	6	8	12
Totals	<u>97</u>	<u>97</u>	<u>97</u>	<u>97</u>
Curriculum Total	128	128	128	128

## Agricultural Systems Management

The agricultural systems management (ASM) major prepares students for success in the delivery, management, and technical support of systems for food, agricultural, or closely related industries.

The ASM major blends the study of mechanized systems principles, computer-based technologies, business management, agricultural sciences, and communications. Students complete courses in machinery principles, off-road power systems, precision agriculture, commodity handling and processing, natural resources (soil, water, and air) management, electrical and electronic systems, and information decision support technology.

A strong business background is developed by taking courses in accounting, economics, marketing, management, business law, sales, and finance. Personal career objectives may be pursued through specialization in areas such as agribusiness, production agriculture, or applied technology. Students are encouraged to minor in agribusiness, business administration, or another discipline.

Agricultural systems management graduates are typically employed in positions that provide a link between the researcher, designer, engineer, manufacturer, and the consumer. Employers include companies and agencies that provide

inputs, products, and services for agricultural production; companies or agencies in the business of handling, storing, processing, and distributing agricultural products, commodities, and processed food and non-food products; and companies and agencies that supply services to rural and urban communities. Graduates are also frequently self-employed as owners/operators of commercial farms and businesses, and as consultants or production specialists.

Students from other majors may minor in agricultural systems management by working with department faculty to select 16 credits in agricultural systems management or closely related fields.

Students interested in the innovation, design, test, manufacture, and development aspects of products, processes or systems for agricultural production, food and value-added processing of commodities, or sustainable management of environmental resources should consider the agricultural and biosystems engineering curriculum in the College of Engineering and Architecture.

## Recommended Curriculum Agricultural Systems Management

First Year	Credits
Agri 189, Skills for Academic Success	1
ASM 115, Fundamentals of ASM	3
ASM 125, Fabrication and Constr Tech	3
Comm 110, Fund of Public Speaking	3
CSci 147, Microcomputer Packages	3
Engl 110, 120, College Composition I, II	3,3
Math 103, 105, College Algebra, Trig	3,3
Agriculture/Biological Science Elective	3
Humanities and Fine Arts	3

### Second Year

Acct 200, 201, Elements of Accounting I, II	3,3
AgEc 201, 202, Micro, Macroeconomics	3,3
ASM 264, Natural Resource Mgt Systems	3
ASM 225, Computer Appl in ASM	3
Chem 121, 122 General Chemistry I, II	3,3
Phys 211, 211L, General Physics I, Lab	3,1
Psyc 111, Introduction to Psychology	3

### Third Year

ASM 323, Post Harvest Technology	3
ASM 373, Tractors and Power Units	3
ASM 374, Power Units Lab	1
ASM 378, Machinery Principles and Mgt	3
Stat 330, Intro Statistics	3
Agriculture/Biological Science Elective	3
Comm Elective	3
Wellness	2
Electives (Free)	6
Electives (Specialization/Minor)*	7

### Fourth Year

ASM 354, Electricity and Electronic Appl	3
ASM 368, Structures and Environ Syst	3
ASM 427, Unit Operations in Food Manuf	3
ASM 475, Mgt of Agricultural Systems	2
ASM 491, Seminar	1
Agriculture/Biological Science Elective	5
Humanities and Fine Arts	3
Electives (Option/Minor)*	9
Elective (Free)	2

**\*Options/Minors (Choose One)**

**Agribusiness or Business Administration (16)**

Students select courses in agricultural economics, business, and related areas to achieve career goals in agribusiness and related industries.

A dealer management specialization within the business option is available. This specialization is designed for students who want careers as equipment dealer managers or with equipment manufacturers. Technology, agribusiness, and communications are emphasized. Requirements include a minor in agricultural economics, agribusiness, or business administration and two paid internships with equipment dealerships. Several industry scholarships are available to students enrolled in this specialization.

**Applied Technology (16)**

Students select courses to enhance curriculum diversity or interests in areas such as communications, international studies, industrial management, construction management, or food processing.

**Production Agriculture (16)**

Students select courses in agricultural sciences and supporting areas to achieve career goals in the technical and management aspects of production agriculture.

Curriculum Total . . . . . 128

**Agricultural/Industrial Equipment Option**

The agricultural/industrial equipment option in the ASM program is collaboratively offered by North Dakota State University and North Dakota State College of Science (NDSOS). This collaboration gives students primary experience in physical science, engineering technology, and machinery systems with complementary hands-on training in mechanized systems laboratories at NDSOS. Students complete their education at NDSU in agricultural systems management and complement their program by selecting a business specialization or minor emphasizing courses in management, sales, marketing, finance, and personnel management. Completion of one or more cooperative education or internship placements in the equipment industry is also required.

Potential positions available for graduates include salesperson, service manager, parts and inventory control manager, sales manager, territory service manager, finance manager, general manager, regional marketing representative, manufacturer's representative, district sales manager, and warranty manager.

**Recommended Curriculum Agricultural/Industrial Equipment Option\***

First Year at NDSOS	Credits
Comm 110, Fundamentals of Speech . . . . .	3
CSci 101, Computer Literacy . . . . .	2
DTec 101, Electrical Systems . . . . .	2
DTec 112, Intro to Diesel Engines . . . . .	3
DTec 122, Preventive Main/Power Trains . . . . .	3
Econ 201, 202, Micro, Macroeconomics . . . . .	3,3
Engl 110, 120, College Composition I, II . . . . .	3,3
Math 103, 105, College Algebra, College Trig. . . . .	3,2
Tech 121, Engine Fundamentals . . . . .	4
Elective . . . . .	2

\* The remaining curriculum is taken at NDSU in the ASM major.

**Animal and Range Sciences**

The Animal and Range Sciences major is designed to prepare students for careers in agriculture and related fields. Course work includes biological principles, scientific relationships, management practices, and business concepts applicable to animal products, livestock production, and range science.

**Curriculum Options**

Three options are available. Each is designed to strengthen career preparation.

**Production/Business:** This option is for students interested in careers associated with the production, marketing, and management of farm animals and the products they produce.

**Range Science:** This option is for students who are interested in careers that involve the conservation and improvement of natural range resources. This option enables the student to meet federal employment requirements for related careers in range science.

**Science:** This option is designed for students who are interested in specific careers that require advanced course work in the biological sciences. The option is designed to prepare students for graduate study or to provide a science-oriented degree while meeting the course requirements for veterinary schools.

**Minor:** Students may minor in animal and range sciences by completing 16 credits. Formal approval by the department is required.

**Transfer credits:** Transfer courses with grade C or better only will be accepted for courses in the major.

**Major:** The following requirements must be met by all animal and range sciences majors.

**Recommended Curriculum Animal and Range Sciences**

First Year	Credits
AgEc 201, Prin of Microeconomics . . . . .	3
Agri 150, Agriculture Orientation . . . . .	1
Agri 189, Skills for Academic Success . . . . .	1
ARSc 114, Introduction to Animal Sciences . . . . .	3
ARSc 123, Feeds and Feeding . . . . .	3
Chem 121, 121L, General Chemistry I, Lab . . . . .	3,1
Engl 110, 120, College Composition I, II . . . . .	3,3
Math 103, College Algebra . . . . .	3
PISc 110, World Food Crops . . . . .	3
Social/Behavioral Sciences Elective . . . . .	3
Wellness . . . . .	2
Total . . . . .	31

Second, Third and Fourth Years	Options		
	Prod/Bus.	Sci.	Range Sci.
ARSc 220, Livestock Production . . . . .	3	3	3
ARSc 222, Meat Animal Evaluation . . . . .	2	2	-
ARSc 320, 330, 331, Judging . . . . .	2	2	-
ARSc 323, Fund of Nutrition . . . . .	3	3	-
ARSc 336, Intro to Range Mgt . . . . .	3	3	3
ARSc 357, Animal Genetics . . . . .	3	3	-

	Options		
	Prod/Bus.	Sci.	Range Sci.
ARSc 450, 452, 456 . . . . .	-	-	9
ARSc 463, Physiology of Reprod . . . . .	4	4	-
ARSc 470, Applied Nutrition . . . . .	4	4	-
ARSc 480, 482, 484, 486, 488 . . . . .	4	2	2
ARSc 491, Seminar . . . . .	2	2	2
Bot 170, 314, 380, 460 . . . . .	-	-	14
Comm 110, Fund of Public Spkg . . . . .	3	3	3
Engl 320, Practical Writing . . . . .	3	3	3
Biol 202, 202L, Intro Microbiol, Lab . . . . .	3	3	-
PISc 315, Genetics . . . . .	3	3	3
Soil 210, 444 . . . . .	-	-	8
VetS 135, 365 . . . . .	7	3	-
Biology . . . . .	3	4	4
Electives . . . . .	15	16	19
Electives from AgEc, Busn . . . . .	6	-	-
Electives from Humanities . . . . .	6	6	14
Electives from Biol, Bot, Chem, Ent, Genetics, Geol, Math, Micro, Phys, Zoo . . . . .	2	9	-
Organic Chemistry/Biochem . . . . .	4	7	4
Soc/Behav Sci . . . . .	6	6	-
Statistics, Computer Sci . . . . .	6	6	6
Curriculum Totals . . . . .	128	128	128

**Biotechnology**

Biotechnology is the application of technology in living systems to improve, modify, and/or produce important products or processes beneficial to society. Examples of this technology include cell culture, plant regeneration, monoclonal antibodies, gene transfer, recombinant DNA, embryo manipulation, and cell fusion. The application of biotechnology to agriculture offers a tremendous potential in the production of needed food, fiber, timber, and chemical feed stocks. An exciting frontier in agriculture has been opened up with this technology that will complement the traditional methodology in breeding, production, and disease prevention.

The curriculum in biotechnology is an interdisciplinary program requiring knowledge and technical experience in the basic and applied sciences. Students have an opportunity to work with scientists in various areas of agricultural biotechnology. Faculty advisers are assigned to students according to their interests in plants, animals, or microorganisms. Graduates of this program have excellent opportunities for employment in the biotechnology industry or for graduate work. The major in biotechnology leading to a B.S. degree is offered through the College of Agriculture and the College of Science and Mathematics. A 2.50 cumulative grade-point average is required to remain in the program.

**Recommended Curriculum Biotechnology Major**

First Year	Credits
Agri 189, Skills for Academic Success . . . . .	1
Biol 150, 150L, General Biology, Lab . . . . .	3,1
Bot 170, Plant Form and Diversity or Zoo 170, 170L, General Zoology, Lab . . . . .	4
Chem 121, 121L, General Chem I, Lab . . . . .	3,1
Chem 122, 122L, General Chem II, Lab . . . . .	3,1
Engl 110, 120, College Composition I, II . . . . .	3,3
Math 146, 147, Applied Calculus I, II . . . . .	4,4
Wellness . . . . .	2

Second Year	Credits
Chem 341, 341L, Organic Chem I, Lab	3,1
Chem 342, Organic Chem II	3
Micr 350, 350L, Gen Microbiology, Lab	3,1
Phys 211, 211L, College Physics I, Lab	3,1
Phys 212, 212L, College Physics II, Lab	3,1
PLSc 315 <sup>1</sup> , 315L <sup>1</sup> , Genetics, Lab	3,1
Computer Science	3
Social and Behav Sci, Humanities	6

Third Year	Credits
Bioc 460 <sup>1</sup> , 461 <sup>1</sup> , Found of Biochem I, II	4,4
Comm 110, Fund of Public Speaking	3
Micr 470 <sup>1</sup> , Basic Immunology	3
Micr 471 <sup>1</sup> , Immuno & Serology Lab	2
Stat 330, Intro Statistics	3
Biotechnology Elective <sup>1,2</sup>	2
Seminar <sup>1</sup>	1
Social and Behavioral Sci, Humanities	9

Fourth Year	Credits
Bioc 465, Prin of Phys Chem and Biophys	4
Bioc 474 <sup>1</sup> , Methods in Recombinant DNA Tech	3
Bot 380 <sup>1</sup> , Plant Phys or Zoo 460 <sup>1</sup> , Animal Physiology	4
Micr 482 <sup>1</sup> Bacterial Genetics and Phage	3
Biotechnology Elective <sup>1,2</sup>	2-3
Biotechnology Senior Research	2-4
Biotechnology Senior Thesis <sup>1</sup>	1
General Electives	9
Social and Behavioral Sci, Humanities	3
Curriculum Total	128

<sup>1</sup>Major courses

<sup>2</sup>Biotechnology electives (2 courses required): Bioc 473, Methods of Biochemical Research or PSci 409, Isotope Tracer Techniques; Bioc 485, Industrial Biotechnology; Bot 480, Plant Tissue Culture; Micr 445, Animal Cell Culture Techniques; PLSc 484, Plant Tissue Culture and Micropropagation; PPth 453, Microscopy.

## Minor

A minor in biotechnology requires satisfactory completion of 22 credits in the following courses:

Required:	Credits
Bioc 460, Found of Biochemistry I	4
Bioc 461, Found of Biochemistry II	4
PLSc 315, Genetics	3
PLSc 315L, Genetics Laboratory	1

### Electives in Biotechnology Technique

#### Choose 2 courses from the following:

Bioc 473, Methods of Biochemical Research	3
Bioc 474, Meth in Recombinant DNA Tech	3
Bioc 485, Industrial Biotechnology	3
Bot 480, Plant Tissue Cltr	2
Micr 445 Ani Cell Cltr Tech	2
PPth 453, Microscopy	3
PLSc 484, Plant Tissue Cltr & Micropropag	2

### Electives in Specialized Areas (6 credits)

Bot 380, Plant Physiology	4
Micr 470, Basic Immunology	3
Micr 471, Immunology and Serology Lab	1
Micr 482, Bacterial Genetics & Phage	3
PPth 324, Intro to Plant Pathology	3
Zoo 370, Cell Biology	3
Zoo 460, Animal Physiology	4

## Crop and Weed Sciences

Instruction in crop and weed sciences includes field and forage crop production and management, weed science, general and plant genetics, plant breeding, experimental design, and biotechnology. The study of botany and other plant sciences, entomology, plant

pathology, and soil science is basic or related to crop and weed sciences. Students may obtain either a major or minor. A crop and weed sciences major or minor is intended for general use in sales, research, and technical services (crop consultant) of agribusinesses involved in seed, chemical, and other plant production and management aspects; in natural resources conservation service; by those interested in production agriculture; or as a prerequisite for graduate study.

## Minor

Students may minor in crop and weed sciences by selecting a total of 18 credits of study in crop and weed sciences or closely related fields, including Plant Sciences 110, 225, two courses from 311 and 312, 320, or 323, plus a minimum of 5 credits approved by the department. A minimum of 8 credits must be taken at NDSU, and at least 6 credits must be at the 300-400 level.

## Major

All of the following requirements including courses in supporting disciplines must be met by majors.

## Recommended Curriculum Crop and Weed Sciences

First Year	Credits
AgEc 201, Prin of Microeconomics*	3
Agri 150, Ag Orientation	1
Agri 189, Skills for Academic Success	1
Biol 150, 150L, Gen Biology, Lab	3,1
Bot 170, Plant Form and Diversity	4
Chem 121, 121L, General Chem I, Lab	3,1
Engl 110, 120, College Composition I, II	3,3
Math 103, College Algebra	3
PLSc 110, World Food Crops	3
Wellness	2

### Second, Third, and Fourth Years

Written and Oral Communications:	
Comm 110, Fund of Public Speaking	3
Engl 320, Practical Writing	3
Social and Behavioral Sciences*	3
Humanities and Fine Arts*	6
Basic and Applied Sciences:	
Bot 380 or ARSc 323	3-4
Chem 122, 122L, Gen Chem II, Lab	3,1
Chem 240, or Bioc 260	3-4
CSci 147, Microcomputer Pkgs	3
Stat 330, Intro Statistics	3
Crop and Weed Sciences:	
PLSc 225, Principles/Crop Production	3
PLSc 315, 315L, Genetics, Lab	3,1
PLSc 320, Forage Crops	3
PLSc 323, Weed Science	3
PLSc 455, Cropping Systems	3
PLSc 291, 491, Sophomore, Senior Seminars	1,1
PLSc 300, 400, Electives	4
Complementary Agricultural Sciences:	
Biol 202, 202L, Intro Microbiol, Lab	2,1
Ent 350, General Entomology	5
PPth 324, Intro Plant Path	3
Soil 210, Intro Soil Science	4
300-400, Electives	6
Electives	26-28
Curriculum Total	128

\*Required: 6 credits of humanities and fine arts and 6 credits of social and behavioral sciences including AgEc 201. One 3-credit course must fulfill the cultural diversity requirement for general education.

## Curriculum Options

Students may select one of the following options within crop and weed sciences. Students interested in a business career in crop and weed sciences should consider the agribusiness minor through either the College of Agriculture or College of Business Administration. Students interested in integrated pest management should follow the weed science option or pursue a second major in plant protection.

Students interested in biotechnology may major through crop and weed sciences or complete the biotechnology option.

**Biotechnology:** This option is intended for students who wish to work in the biotechnology industry or pursue graduate study in the crop biotechnology area. Students must complete Bioc 460, Bot 380, Micr 350, 350L (instead of Biol 202, 202L), plus Math 105 or 146, PLSc 346, and PLSc 431 or 453, and PLSc 484 or Bot 480.

**Production:** This option is for students most interested in production agriculture. This is the most popular option with students and provides the most flexibility of course selection. This option is fulfilled by completing the basic crop and weed sciences curriculum.

**Science:** This option is intended for students who are interested in graduate studies and want more basic science courses as a foundation for graduate studies. Bot 380, Chem 341, 341L, and Math 146 must be taken under the general Basic and Applied Sciences requirements, plus 12 credits of science electives from outside the agriculture field. Suggested electives are Bioc 350, 460, 461, Bot 314, 460, Chem 342, Math 147, Phys 211, 212, or Stat 331.

**Weed Science:** This option is intended for students interested in crop consulting or weed science areas. AgEc 375 or Busn 431, Bot 380, PLSc 453, and PPth 454, are required. ASM 378, Bot 314, PLSc 210, 211, and Soil 322 are suggested electives. Students pursuing this option should consider a double major in plant protection.

## Food Science

The College of Agriculture and the College of Human Development and Education offer an undergraduate major in food science leading to a B.S. degree.

The food science major is designed to prepare students for a career in the food industry, the "world's largest industry," which is responsible for feeding the world.

The program is unique and is structured to develop an understanding of the nature, properties, and characteristics of foods through foundation courses in biochemistry, chemistry, microbiology, physics, and other sciences. Food science courses are built on this foundation. Applications include the study of food safety, processing, preservation, sanitation, storage,

and marketing of foods. The analysis and microbiological and biochemical characterization of food products are also studied. Additional elective courses in economics and business administration are available to students intending to enter a management career.

**Note:** Transfer credits in food science from other institutions must have grades of C or better to be accepted for the food science program at NDSU.

The curriculum in the food science program is approved by the Institute of Food Technologists (IFT). Students majoring in food science, therefore, are eligible to compete for the prestigious IFT scholarships.

The program also provides the opportunity to gain industrial experience during undergraduate study by means of industry internships.

Upon completion of the program, graduates will be able to recognize, critically analyze, and solve problems realistically in both industrial and academic environments.

## Recommended Curriculum Food Science

First Year	Credits
Agri 150, Ag Orientation . . . . .	1
Agri 189, Skills for Academic Success . . . . .	1
Chem 121, 121L, General Chemistry I, Lab . . . . .	3,1
Chem 122, 122L, General Chemistry II, Lab . . . . .	3,1
CSci 147, Microcomputer Packages . . . . .	3
CS 210, Intro to Food Sci and Tech . . . . .	2
Engl 110, 120, College Composition I, II. . . . .	3,3
F&N 250, Nutrition Science. . . . .	3
Math 146, 147, Applied Calculus I,II or Math 165, 166, Calculus I,II. . . . .	4,4
Total. . . . .	32

Second Year	Credits
AgEc 201, Prin of Microeconomics . . . . .	3
ARSc 340, Meat Science and Technology. . . . .	3
Biol 150, General Biology . . . . .	3
Chem 341, 341L, Organic Chemistry I, Lab . . . . .	3,1
Comm 110, Fund of Public Speaking . . . . .	3
Phys 211, 211L, College Physics I, Lab . . . . .	3,1
*Electives . . . . .	12
Total. . . . .	32

Third Year	Credits
Bioc 460, Biochemistry. . . . .	4
CS 430, 431, Food Unit Operations, Lab . . . . .	2,1
Engl 320, Practical Writing . . . . .	3
Micr 350, 350L, General Microbiol, Lab . . . . .	3,1
Stat 330, Introductory Statistics . . . . .	3
*Electives . . . . .	15
Total. . . . .	32

Fourth Year	Credits
CS 450, Cereal Technology . . . . .	3
CS 460, 461, Food Chemistry, Lab . . . . .	3,1
CS 470, 471, Food Processing, Lab. . . . .	3,1
F&N 464, Food Analysis . . . . .	3
Micr 453, Food and Dairy Microbiology. . . . .	3
*Electives . . . . .	15
Total. . . . .	31
Curriculum Total . . . . .	128

\*Electives may be chosen from approved courses to fulfill the general education requirements, and to emphasize one of the following areas: sciences, engineering, business, nutrition, or processing.

## General Agriculture Degree Program

The degree program in general agriculture is designed to serve students who wish to pursue a college education in a broad area of agriculture or who want to tailor a program to meet their specific career objectives. Traditionally, students interested in careers focusing on agricultural production follow this program of study.

Students electing to graduate with a general agriculture major must file a "plan of study" with the General Agriculture Coordinating Committee by the third week of the second semester of the junior year. This plan of study must include a "statement of goals" or why a tailored degree is desired and an outline of courses to be taken to meet their stated career goals. Identification of the capstone course and any internship that the student plans to take is also to be included in the plan of study.

## Curriculum Requirements General Agriculture Major

	Credits
Major . . . . .	42
Required: a minimum of 12 credits in two Ag disciplines plus 9 credits in two other Ag disciplines.	
Basic and Applied Sciences . . . . .	20
Required: Chem 121, CSci 146 or 147, Math 103 or 104, PISc 315, and Stat 330	
Written and Oral Communications. . . . .	12
Required: Comm 110, Engl 110, 120, and 220 or 320	
Social/Behavioral Sciences and Humanities . . . . .	12
Required: Six credits in Humanities	
Agricultural Science Electives . . . . .	12
Electives. . . . .	26
Other	
Agri 150, Ag Orientation . . . . .	1
Agri 189, Skills for Academic Success . . . . .	1
Wellness . . . . .	2
Curriculum Total . . . . .	128

## Minor

A minor in general agriculture may be obtained by satisfactorily completing 24 credits with at least six credits in each of any four disciplines offered by the College of Agriculture. The minor is intended for students who are majoring in a college other than agriculture.

## General Agriculture Exploratory Program (Non-Degree Program)

The exploratory program in general agriculture is intended for students who know they are interested in agriculture but are undecided on a major. This program is designed to expose students to various agricultural disciplines and, thereby, various career options. New students are encouraged to enroll in at least three introductory courses in different agricultural majors in their freshman year in addition to completing general education requirements in

English, math, chemistry, social and behavioral sciences, and humanities. By following the exploratory program, students may easily be phased into a specific discipline by the end of their sophomore year. About 85% of entering students selecting general agriculture initially will transfer to a specific discipline.

## Exploratory General Agriculture (Non-Degree Program)

First Year	Credits
*Agricultural Sciences . . . . .	8-12
**Basic Sciences. . . . .	7
English . . . . .	6
Mathematics. . . . .	3
Orientation/Skills for Success . . . . .	2
Social and Behavioral Sciences . . . . .	6

Second Year	Credits
*Agricultural Sciences . . . . .	10-12
**Basic Sciences. . . . .	10
Computer Science . . . . .	3
Social and Behavioral Sciences/Humanities . . . . .	3-6
Speech Communication . . . . .	3
Wellness. . . . .	2
Electives. . . . .	3

\*Agricultural science courses recommended include AgEc 201, 242 or 244; AgEd 232; ASM 115 or 125; ARSc 114 or 123; Biol 202 and 202L; CS 210; Ent 210 or 350; PISc 110, 111, 210 and 211 or 225; PPth 324; or Soil 210.

Students are encouraged to select at least one course within each discipline.

\*\*Basic science courses in biology, botany, chemistry, entomology, microbiology, or zoology are recommended.

Advisers for students in the exploratory program are selected from the various disciplines in agriculture. These faculty members work with students to develop an appropriate plan of study and assist them in exploring various career opportunities. Once the student identifies the discipline of choice, an adviser in that discipline should be selected by the student.

## Horticulture

Instruction and study in horticulture is focused on fruits, vegetables, turfgrass, and woody and herbaceous landscape plants, including propagation, production, culture, marketing, processing, and utilization. Horticulture encompasses the design and planting for landscapes, parks, highways, and public facilities including interiorscapes in rural, suburban, and urban areas. It includes skills for management of nursery, garden center, greenhouse, seed, fruit, vegetable, turfgrass, biotechnology, and specialty crop enterprises, as well as floral design and flower shops.

The horticulture major is a four-year curriculum leading to the B.S. degree. Students may also minor in horticulture. Prospective students should consult with department advisers regarding horticulture programs and options so their educational needs may best be fulfilled. Master of Science and Ph.D. degree programs are also available. Refer to the Graduate Bulletin for details.

## Curriculum Options

Horticulture majors may select one or more options of study. All of the requirements for the major and the supporting disciplines must be met to complete any horticulture option. Students may select from the following five options.

**Horticulture Biotechnology:** This option is for students who plan to engage in laboratory research or further their education in the biotechnology of horticultural crops.

**Horticulture Science:** This option is for students who plan to continue formal graduate school education leading to careers in research, teaching, and extension.

**Landscape:** This option is for students interested in planning, designing, and installing landscape plantings for functional and aesthetic purposes (a 16-credit minor in landscape architecture is required).

**Production Business:** This option is for students who wish to grow, market, and process horticultural crops; for example, nursery and/or greenhouse flower, fruit, and vegetable crops.

**Urban Forestry and Parks:** This option is for students who desire a career in the management of urban forests and the horticultural aspects of park-like areas, including golf courses and other sports facilities.

## Special Opportunities

**Pre-Forestry:** A two-year pre-forestry curriculum may be selected by the student who desires to major in forestry. However, the forestry student must transfer to another institution to complete degree requirements.

**Interdisciplinary Program:** A four-year interdisciplinary program (plant protection major) is available with a horticultural specialization. (See Plant Protection).

**Horticulture and Forestry Club:** This club meets monthly. Members take field trips to botanical gardens, arboreta, trade shows, parks, and other horticultural sites. They are also actively involved in growing and marketing of flowers and foliage plants, regional and national judging contests, and horticulture science and education programs.

## Recommended Curriculum Horticulture Major

First Year	Credits
AgEc 201 or 202, Prin of Micro or Macro	3
Agri 150, Ag Orientation	1
Agri 189, Skills for Academic Success	1
Biol 150, 150L, Gen Biology, Lab	
(Biol 150L not required for Landscape OR Urban For-Prk Options)	3,1
Bot 170, Plant Form and Diversity	4
Chem 121, 122, 121L, Gen Chem I, II, Lab I	3,3,1
Engl 110, 120, College Composition I, II	3,3
Math 103, College Algebra (Not required for Biotech Option)	3
PISc 210, 211, Horticulture Science, Lab	3,1
Total	31

Horticulture Options	Hort Biotech	Hort Sci	Lndscsp	Prod Busn	Urban For-Prk
<b>Major:</b>					
PISc 177, Floral Design	-	2	-	-	-
PISc 219, Prairie & Comm For	-	-	-	-	2
PISc 341, Land Bidding & Contr	-	-	1	-	-
PISc 355, Woody Land Plants	3	3	3	3	3
PISc 360, Hort Food Crops	4	4	-	4	-
PISc 365, Herb Land Plants	-	-	2	-	2
PISc 368, Plant Propagation	3	3	-	3	-
PISc 372, Grnhse Crop Prod	-	-	-	3	-
PISc 375, Turf Management	-	-	3	-	3
PISc 382, Nursery Crop Prod	-	-	-	2	-
PISc 465, Advanced Land Plants	-	-	2	-	2
PISc 485, Arboriculture	-	-	-	-	3
PISc 484, Pl Tiss Cult & Micro	2	-	-	-	-
PISc 486, Eco-Physiol of Hort Crp	2	2	2	2	2
PISc 491, Hort Seminar	1	1	1	1	1
PISc Electives	5	7	4	2	2
<b>Agriculture:</b>					
Ent 350, General Entomology	5	5	5	5	5
PISc 315, Genetics	3	3	3	3	3
PISc 315L, Genetics Lab	1	1	-	1	1
PISc 323, Prin of Weed Science	-	3	3	3	3
PPth 324, Intro Plant Path	3	3	3	3	3
PPth 455, Plant Disease Mgt	-	-	-	3	-
PPth 456, For & Shade Tree Path	-	-	-	-	3
Soil 210, Intro to Soil Science	-	4	4	4	4

	Hort Biotech	Hort Sci	Lndscsp	Prod Busn	Urban For-Prk
<b>Basic and Applied Sciences:</b>					
Biol 202, Intro Micro	2	-	-	-	-
Biol 202L, Intro Micro Lab	1	-	-	-	-
Bot 380, Plant Physiology	4	4	-	-	-
Bot 460, Plant Ecology	-	-	3	-	3
Chem 240, Survey of Organic Chem OR/ Chem 260, Elements of Bioc	-	4	-	3/4	3/4
Chem 341, Org Chem I	3	3	-	-	-
Chem 341L, Org Chem Lab	-	1	1	-	-
Chem 342, Org Chem II	3	-	-	-	-
CSci 147, Microcomp Pkgs	3	3	3	3	3
Math 146, Applied Calculus I	-	4	4	-	-
Phys 120, Fund of Physics	-	3	-	-	-
Stat 330, Intro Statistics	3	3	3	3	3
<b>Humanities and Fine Arts/ Soc and Behavioral Sci:</b>					
(including AgEc 201 or 202, Micro or Macro)	12	12	12	12	12
<b>Written and Oral Communications:</b>					
Comm 110, Fund Public Speaking	3	3	3	3	3
Engl 320, Practical Wtg	3	3	3	3	3
<b>Related:</b>					
Acct 102, Fundamentals of Acct	-	-	-	3	-
AgEc 380, Pub Pol Choices	-	-	-	-	1
AgEc 382, Econ State & Loc Govt	-	-	-	-	2
Busn 350, Prin of Mgt	-	-	-	3	3
Busn 431, Busn Law I	-	-	3	-	-
Busn 450, Human Resource Mgt	-	-	-	3	-
HPER 426, Parks & Rec Adm	-	-	-	-	3
LA 331, Intro to Planting Design	-	-	-	-	3
PolS 360, Prin of Pub Admin	-	-	-	-	3
Wellness	2	2	2	2	2
<b>Minor in Biotechnology</b>					
(See Hort Biotech Opt)	13	-	-	-	-
<b>Minor in Landscape Arch</b>					
(See Landscape Hort Opt)	-	-	16	-	-
<b>General Electives</b>					
	<u>11</u>	<u>13</u>	<u>9</u>	<u>16-17</u>	<u>8-9</u>
Curriculum Totals	128	128	128	128	128

## Horticulture Minor

<b>Required Horticulture Courses:</b>	<b>Credits</b>
PISc 210, 211, Hort Science, Lab	3,1

### At least three of the following four courses:

PISc 355, Woody Landscape Plants	3
PISc 360, Horticultural Food Crops	4
PISc 365, Herbaceous Landscape Plants	2
PISc 368, Plant Propagation	3

### Electives from the following to total 18 credits minimum:

Any 300-400 level PISc course (except PISc 321), Ent 350, PPTH 324, or Soil 210.

## Two-Year Pre-Forestry

### First Year

AgEc 201, Prin Microeconomics	3
Agri 150, Ag Orientation	1
Agri 189, Skills for Academic Success	1
Biol 150, General Biology	3
Bot 170, Plant Form and Diversity	4
Chem 121, 122, 121L, Chem I,II, Lab I	3,3,1
Engl 110, 120, College Composition I,II	3,3
Math 103, 105, or above, College Alg, Trig	3,3
Wellness	2
<b>Total</b>	<b>33</b>

### Second Year

Comm 110, Fund of Public Speaking	3
CSci 147, Microcomputer Packages	3
Ent 350, General Entomology	5
Phys 120, Fund Physics	3
PISc 219, 355, Pr and Com For, Wdy Land Pla	2,3
PISc 315, 315L, Genetics, Lab	3,1
Soil 210, Intro Soil Science	4
Soc Sci, Hum and Fine Arts Electives	6
<b>Total</b>	<b>33</b>

## Microbiology

Microbiology is a fundamental biological science that offers a variety of challenges and opportunities. Some of the most important scientific discoveries in this century have been made by microbiologists. Since 1910, about one-third of the Nobel Prizes in medicine and physiology have been awarded to microbiologists. The discipline covers a wide spectrum of specialized interest areas that show how microbes affect human and animal health, our environment, food technology, and the biotechnology industry. In recent years, the field of microbiology has had a major impact upon virtually all other scientific disciplines. For this reason, even students who choose to major in other fields may find it advantageous to minor in microbiology.

Students may minor in microbiology by selecting a total of 16 credits including Microbiology 350-350L. Additional credits are to be earned in other 300- or 400-level microbiology courses, Plant Pathology 460, or Veterinary Science 365.

## Recommended Curriculum Microbiology

<b>First Year</b>	<b>Credits</b>
Agri 189, Skills for Academic Success	1
Biol 150, 150L, General Biology, Lab	3,1
Chem 121, 121L, General Chemistry I, Lab	3,1
Chem 122, 122L, General Chemistry II, Lab	3,1
Comm 110, Fund of Public Speaking	3
Engl 110, 120, College Composition I, II	3,3
Biol 202, 202L, Intro Micro, Lab or Zoo Elective	3-4
Math, or Statistics (GenEd)	3-4
Wellness	2
<b>Second Year</b>	
Chem 341, 341L, Organic Chem I, Lab	4,1
Chem 342, Organic Chem II	3
Micr 350, 350L, Gen Microbiology, Lab	3,1
Phys 211, 211L, College Phys I, Lab	3,1
Phys 212, 212L, College Phys II, Lab	3,1
PISc 315, 315L, Genetics, Lab	3,1
Elective Major Courses	2-5
Math, or Statistics Elective	2-4
<b>Third Year</b>	
Bioc 460, 461, Found of Biochem I,II	4,4
Elective Major Courses	13-15
Humanities	6
Social and Behavioral Sciences	3-6
<b>Fourth Year</b>	
Micr 486, Capstone	3
Elective Major Courses	5-11
Other Writing or Speaking	3
Social and Behavioral Sci	3-6
General Electives (balance of credits to total at least 128)	

## Natural Resources Management

The natural resources management major prepares students to fill positions requiring a broad background in natural resources as well as depth in one or two specific areas. The program addresses the biological, engineering, and social and economic aspects of managing natural resources as an integrated system.

The natural resources management major, leading to a B.S. degree, is offered through the Colleges of Agriculture, Engineering and Architecture, and Sciences and Mathematics.

## Emphasis Areas

Natural resources management majors may choose from courses in one of the three emphasis areas.

**Biotic Resources Science:** This emphasis area deals with basic scientific principles that govern the interrelationship between biotic (e.g., plants, animals, insects, microorganisms) and abiotic factors (e.g., climate, soils) in major ecosystems and the use of these principles for environmentally sound management of natural resources and agroecosystems. Topics of study include grassland ecosystems, wetland ecosystems, land reclamation, agroforestry, wildlife, sustainable agriculture, soil biology, and others.

### Physical/Earth Resources Sciences:

This emphasis area provides an understanding of the physical and chemical aspects of ecosystems. Topics of study include hydrology, water management and quality, waste management, soil properties, data acquisition, energy resources, and land-use management.

**Social Sciences:** This emphasis area prepares students for management, administrative, regulatory, and policy positions that require a broad understanding of the social, biological, and physical aspects of natural resources management and allocation. This area concentrates on human factors (social, political, economic) in environmental management, while recognizing constraints and opportunities presented by physical and biological factors.

## Recommended Curriculum

### Natural Resources Management

First Year	Credits		
AgEc 201, Prin of Microeconomics . . . . .			3
Agri 189, Skills for Academic Success . . . . .			1
Biol 150, General Biology . . . . .			3
Chem 121 or 150, Gen Chem I or Prin of Chem I . . . . .			3
Chem 121L or Geol 105L, Lab . . . . .			1
Comm 110, Fund of Public Speaking . . . . .			3
Engl 110, 120, College Composition I, II . . . . .			3,3
Geol 105, Physical Geology . . . . .			3
Math 104, Finite Mathematics . . . . .			3
NRM 150, Orientation . . . . .			1
Wellness . . . . .			2
Total . . . . .			29

	Biotic Resources	Options Physical & Earth Resources	Social Sci.
<b>Second Year</b>			
AgEc 375, Appl Ag Law	2	2	2
NRM 225, Natural Resources & Agroeco	3	3	3
Bot 170 or Zoo 170, 170L, Plant Form or Gen Zoo	4	4	4
Bus 280 or Econ 220, Intro to Busn or Econ of Reg	3	3	3
Engl 215 or 320, Wtg for Work or Pract Writing	3	3	3
Hist 267 or Pols 215, US Envir Hist or Prob & Pol in Amer Govt	3	3	3
Math 146, Applied Calculus I	-	4	-
Math 147, Applied Calculus II	-	4	-
NRM 264, Nat Resource Mgt	3	3	3
Soil 210, Intro to Soil Sci	4	4	4
Stat 330, Intro Statistics	3	3	3
Emphasis Area	2	-	5
Free Electives	5	-	2
Totals	35	36	35

<b>Third Year</b>			
AgEc 380, Publ Policy Choice	1	1	1
AgEc 382, Econ of State and Local Govt	-	-	2
ASM 299, Meas in NRM	-	1	-
Biol 364, General Ecology	3	3	3
Chem 122, Gen Chem II	3	-	-
Chem 260, Elem of Biochem	4	-	-
Econ 341, Intermed Microecon	-	-	3
Geol 412, Geomorphology or Soil 444, Soil Genesis & Survey	-	4	-
NRM 381, Resource Econ	2	2	2
Soc 340, Soc Research Meth or AgEc 339, Quan Meth & Decision Making	-	-	3
Humanities and Fine Arts	3	3	3
Science and Technology	2	2	2
Emphasis Area	6	2	2
Free Electives	6	12	9
Totals	31	30	31

<b>Fourth Year</b>			
Capstone	3	3	3
Cultural Diversity	3	3	3
Geog 455, Geo Info Systems	3	3	3
Humanities and Fine Arts	3	3	3
NRM 491, Senior Seminar	1	1	1
Emphasis Area	17	17	16
Free Electives	2	2	3
Totals	32	32	32
Curriculum Totals	128	128	128

## Plant Protection Major

Plant protection is the management of insects, weeds, and diseases that affect agronomic and horticultural crops. The major is interdisciplinary, combining plant pathology, entomology, and plant sciences. The major gives students a firm foundation in pest and disease management and other critical agronomic areas such as soil science, crop and weed relationships, plant genetics, and horticulture. The plant protection major is designed to prepare professionals who are directly involved with pest management, who consult and advise others in management practices, or who work with businesses that are impacted by pest problems.

Students may obtain either a minor or major. Because of the important differences in production systems, students may select an option in either agronomic or horticultural plant protection. This major also allows students to take electives to fill the requirements for entry into a graduate program in plant sciences, entomology, or plant pathology.

### Recommended Curriculum

#### Plant Protection

First Year	Credits		
Agri 150, Ag Orientation . . . . .			1
Agri 189, Skills for Academic Success . . . . .			1
AgEc 201, Prin of Microeconomics . . . . .			3
Biol 150, 150L, General Biology, Lab . . . . .			3,1
Chem 121, 121L, General Chemistry I, Lab I . . . . .			3,1
CSci 147, Microcomputer Packages . . . . .			3
Engl 110, 120, College Composition I, II . . . . .			3,3
Math 103, College Algebra . . . . .			3
PISc 110, World Food Crops or PISc 210, 211, Hort, Lab . . . . .			3-4
Humanities and Fine Arts . . . . .			3
<b>Second Year</b>			
Biol 202, 202L, Intro Microbiol, Lab . . . . .			2,1
Bot 170, Plant Form and Diversity . . . . .			4
Chem 122, 122L, General Chemistry II, Lab II . . . . .			3,1
Comm 110, Fund of Public Speaking . . . . .			3
PISc 291, Sophomore Seminar . . . . .			1
Soil 210, Intro to Soil Sci . . . . .			4
Stat 330, Intro Statistics . . . . .			3
Field Crops or Hort Specialization . . . . .			3
Humanities and Fine Arts . . . . .			3
Social and Behavioral Sciences . . . . .			3
Wellness . . . . .			2

<b>Third Year</b>			
AgEc 375, Applied Ag Law . . . . .			2
Biol 364, General Ecology . . . . .			3
Chem 260, Elements of Biochemistry . . . . .			4
Engl 320, Practical Writing . . . . .			3
PISc 315, 315L, Genetics, Lab . . . . .			3,1
PISc 323, Principles of Weed Science . . . . .			3
PPth 324, Intro Plant Pathology . . . . .			3
Field Crops or Hort Specialization . . . . .			6
General Electives . . . . .			6

<b>Fourth Year</b>			
Bot 380, Plant Physiology . . . . .			3
PISc 453, Advanced Weed Science . . . . .			2
PISc 496, Internship . . . . .			1-3
PISc 491, Senior Seminar . . . . .			1
Soil 322, Soil Fertility . . . . .			3
Field Crops or Hort Specialization . . . . .			8-10
General Electives . . . . .			10-13
Curriculum Total . . . . .			128

## Curriculum Options

**Agronomic:** This option is for students interested in pest management in field crop production.

Field Crops Specialization	20 Credits
Ent 350, Gen Entomology . . . . .	5
PISc 225, Prin Crop Production . . . . .	3
PISc 320, Prin Forage Prod . . . . .	3
PISc 455, Cropping Systems . . . . .	3
PPth 454, Diseases/Field Crops . . . . .	3
Elective . . . . .	3

**Horticulture:** This option is for students interested in management of urban plant problems and pests associated with fruits, vegetables, landscape plants, and nursery/greenhouse crops.

Horticulture Specialization	19 Credits
Ent 350, Gen Entomology . . . . .	5
PISc 355, 365, Landsc Plants . . . . .	3, 2
PISc 360, Hort Food Crops . . . . .	4
PISc 486, Eco-Physio/Hort Crop . . . . .	2
PPth 455/456, Plant Disease Mgt . . . . .	3

## Soil Science

Soil science deals with soil and the associated atmosphere, especially the environment in which crops grow. Study is designed to provide understanding of these basic resources. This includes the processes operative in the soil-plant atmosphere continuum and their amenability to management for improving results with crops and for soil protection. Study deals with the major areas of soil science, including fertility management, conservation, physics, chemistry, genesis, and classification, as well as the closely interacting field of agricultural meteorology.

Students also gain an appreciation for environmental concerns such as erosion, land-use decisions, and water quality.

The following requirements must be met by all majors in soil science:

### Recommended Curriculum

#### Soil Science

First Year	F	S	Credits
Agri 150, Ag Orientation . . . . .			1
Agri 189, Skills for Academic Success . . . . .			1
Chem 121, 121L, Gen Chemistry I, Lab . . . . .			3,1
Chem 122, 122L, Gen Chemistry II, Lab . . . . .			3,1
Engl 110, 120, College Composition I,II . . . . .			3
Math 103, 105, College Algebra, Trig . . . . .			3
PISc 110, World Food Crops . . . . .			3
Wellness . . . . .			2
Electives . . . . .			5
Totals . . . . .			17

<b>Second Year</b>			
ASM 264, Natural Resource Mgt Sys . . . . .			3
CSci 147, Microcomp Pkgs, 122, BASIC, or 126, FORTRAN . . . . .			3
Math 146 or 165, Calculus . . . . .			4
Phys 211, 211L, General Physics, Lab . . . . .			3,1
Soil 210, Intro to Soil Science . . . . .			4
Soil 217, Intro to Meteorol and Climat . . . . .			3
Soil 322, Fertility and Fertilizer . . . . .			3
Electives . . . . .			3
Totals . . . . .			15

	Credits	
	F	S
<b>Third Year</b>		
Biol 150, General Biology . . . . .	3	
Biol 202, 202L, Intro Microbiol, Lab . . . . .		2,1
Chem 240 or 341, Organic Chemistry . . . . .	3	
Comm 110, Fund of Public Speaking . . . . .		3
Soil 321, Mgt and Conservation . . . . .	3	
Soil 333, 339, Managing Soil Phys Prop, Lab . . . . .	2,1	
Stat 330, Intro Statistics . . . . .		3
Electives . . . . .	4	6
Totals . . . . .	16	15
<b>Fourth Year</b>		
Engl 215, Wtg/Work or 320, Pract Wtg . . . . .		3
Soil 444, Soil Genesis and Survey . . . . .	4	
Soil 455, Soil Chemistry . . . . .	3	
Soil 499, Soil Microbiology . . . . .		2
Soil 491, Capstone Seminar I, II . . . . .	1	1
Electives . . . . .	8	10
Totals . . . . .	16	16
Curriculum Total . . . . .		128

### Soil Science Minor

A minor in soil science requires a minimum of 16 semester credits. An introductory course and at least one course in each of the soil science discipline areas are required. The following guidelines are recommended:

Soil 210, Intro to Soil Science  
 Soil 217 or 333 and 339 or 447  
 Soil 321  
 Soil 322 or 455 or 465  
 Soil 410 or 444

Up to two credits may be substituted for a related course in a different department. For example, a civil engineering course emphasizing soil mechanics (e.g., CE 316) may be substituted for a soil physics course. Contact the department chair (231-8903) for questions about course substitution.

### Veterinary and Microbiological Sciences

This department offers instruction in veterinary science and microbiology (listed earlier), including the anatomy and physiology of domestic animals; the epidemiology and prevention of livestock diseases; courses in virology, medical terminology, animal restraint, and introduction to the veterinary profession.

The courses are primarily for supplementary training to students majoring in animal or biological sciences. The veterinary technology major is offered through the department.

### Recommended Curriculum

#### Pre-Veterinary Medicine

All veterinary schools stress the importance of high scholastic standing and judge applicants on academic preparation, character, personality, general fitness, and adaptability for veterinary medicine.

For entrance, most veterinary medical schools require at least two years of general college study.

Because the number of students admitted to veterinary schools is limited, prospective students should check the specific requirements of the college of their choice well in advance to make certain that preparatory work is properly channeled. Consult the pre-veterinary adviser.

Pre-Veterinary students should enroll in the College of Agriculture.

#### Veterinary Technology

Veterinary technology is an exciting and challenging major that offers a multitude of career opportunities in animal health care and related areas. The veterinary technology major leads to the B.S. degree. This major offers a well-rounded program of general and clinical studies. Graduates are prepared not only for traditional veterinary practice careers, but also for pursuit of emerging non-traditional careers through the choice of electives and minor areas of study.

The first year of the veterinary technology program is open to all interested students and offers an opportunity to explore the veterinary technology field. Advancement into the second year of the program is limited to a maximum of 24 students who are selected on a competitive basis.

The veterinary technology program is accredited by the American Veterinary Medical Association.

### General Courses

	Credits
Acct 102, Fundamentals of Acct . . . . .	3
Agri 189, Skills for Academic Success . . . . .	1
ARSc 114, Intro to Animal Sciences . . . . .	3
Biol 150, 150L, General Biology, Lab . . . . .	3,1
Biol 202, 202L, Intro Microbiology, Lab. . . . .	2,1
Chem 117, 117L, Chem Concepts, Lab or Chem 121, 121L, Gen Chem I, Lab . . . . .	3,1
Comm 110, Fund of Public Speaking . . . . .	3
CSci 146, Busn Use or 147, Micro Packages . . . . .	3
Engl 110, 120, College Composition I, II. . . . .	3,3
Engl 320, Practical Writing . . . . .	3
Math 104, Finite Math. . . . .	3
Micr 460, Pathogenic Microbiology . . . . .	3
PLSc 315, 315L, Genetics, Lab. . . . .	3,1
VetS 194, Breeds of Animals . . . . .	1
VetS 365, Fund of Animal Disease . . . . .	4
General Electives . . . . .	13
Humanities and Fine Arts . . . . .	6
Science and Technology Electives . . . . .	3
Social and Behavioral Sciences . . . . .	6
Wellness . . . . .	2

### Pre-Professional Veterinary Technology Courses

VetS 115, Medical Terminology . . . . .	1
VetS 125, Animal Restraint . . . . .	2
VetS 135, Anat and Phys of Domestic Ani. . . . .	3
VetS 136, Anatomy and Phys Lab. . . . .	1
VetS 150, Intro to the Vet Profession . . . . .	1

### Professional Veterinary Technology Courses

(limited enrollment)	
VetS 196, Ward/Clinic Care 2 @ 1 credit . . . . .	2
VetS 255, Fund of Vet Radiography . . . . .	3
VetS 256, Vet Clinical Tech. and Instruments . . . . .	3
VetS 259, Small Animal Diseases . . . . .	2
VetS 357, Vet Pharmacology . . . . .	3
VetS 358, Vet Surg Nurs Tech . . . . .	4
VetS 359, Vet Hosp Info and Proc . . . . .	2
VetS 385, Vet Clin Path I. . . . .	3
VetS 386, Vet Clin Path II . . . . .	3
VetS 387, Vet Clin Path III . . . . .	3
VetS 485, Externship . . . . .	12
VetS 496, Ward/Clinic Care 2 @ 1 credit . . . . .	2
Curriculum Total . . . . .	128