

AGRONOMY

Undergraduate Study

Agronomy is the science and technology of producing plants that serve humans, using practices essential for maintaining and improving life. The Department of Agronomy offers a major leading to a degree of bachelor of science (BS) in agronomy. Graduates have the theoretical and practical knowledge needed for efficient and sustainable crop production. They are skilled in critical thinking, problem solving, communicating, and working effectively with others. They understand the ethical, cultural, and environmental dimensions of issues facing agronomists globally.

An agronomy major prepares students for employment in crop production and soil management, yield forecasting, precision farming, plant breeding, agricultural business and industry, agricultural service organizations, environmental and natural resource management, and farm management. Graduates pursue careers in the seed, fertilizer, and agricultural chemical industries as field agronomists, crop and soil management specialists, research technicians, sales and marketing specialists, and production managers. State and federal agencies employ agronomists as extension specialists, county extension directors, environmental and natural resource specialists, research associates, soil surveyors, soil conservationists, grain inspectors, integrated pest managers, land appraisers, agricultural lenders, and other science-based professionals.

An agronomy major also prepares students for graduate school. We offer a concurrent BS/MBA degree. About a quarter of our students immediately continue into research-based MS and PhD programs. As an undergraduate, there are many opportunities to be involved in research.

Department of Agronomy website - <http://www.agron.iastate.edu/>.
(<http://www.agron.iastate.edu/>)

Student Learning Outcomes

Upon graduation, students should be able to:

KNOWLEDGE: Graduates of our bachelor's degree program will demonstrate knowledge of the scientific principles and practices needed for success as an agronomist.

INTEGRATION AND PROBLEM-SOLVING: Graduates of our bachelor's degree program will integrate knowledge and skills to systematically assess, critically analyze, and sustainably manage agronomic systems.

PROFESSIONALISM AND CAREER READINESS: Graduates of our bachelor's degree program will demonstrate professional skills and career readiness.

COMMUNICATION: Graduates of our bachelor's degree program will communicate and engage effectively with diverse audiences.

DIVERSE WORLDVIEWS: Graduates of our bachelor's degree program will demonstrate knowledge of diverse worldviews that affect agronomic practices.

ETHICAL, ENVIRONMENTAL, AND ECOLOGICAL ASPECTS: Graduates of our bachelor's degree program will demonstrate knowledge of the ethical, environmental, and ecological aspects of agronomic practices.

Curriculum in Agronomy

Total Degree Requirement: 128 cr.

Only 65 cr. from a two-year institution may apply which may include up to 16 technical cr.; 9 P-NP cr. of free electives; 2.00 minimum GPA. A minimum of 15 credits of agronomy courses must be earned at Iowa State and not transferred from other institutions.

International Perspective: 3 cr.

3 cr. from approved International Perspective list: <http://www.registrar.iastate.edu/students/div-ip-guide/IntlPerspectives-current> (<http://www.registrar.iastate.edu/students/div-ip-guide/IntlPerspectives-current/>)

U.S. Diversity: 3 cr.

3 cr. from approved U.S. Diversity list: <http://www.registrar.iastate.edu/students/div-ip-guide/usdiversity-courses> (<https://www.registrar.iastate.edu/students/div-ip-guide/usdiversity-courses/>)

Communication/Library: 13 cr.

6 cr. of English composition with a C or better and 3 cr. of speech fundamentals with a C or better.

ENGL 150	Critical Thinking and Communication	3
ENGL 250	Written, Oral, Visual, and Electronic Composition	3
SP CM 212	Fundamentals of Public Speaking	3
or AGEDS 311	Presentation and Sales Strategies for Agricultural Audiences	
LIB 160	Introduction to College Level Research	1

One of the following:

ENGL 302	Business Communication	3
ENGL 309	Proposal and Report Writing	3
ENGL 312	Communicating Science and Public Engagement	3
ENGL 314	Technical Communication	3

Humanities: 3 cr.

3 cr. from approved humanities list: <http://www.cals.iastate.edu/student-services/humanities> (<http://www.cals.iastate.edu/student-services/humanities/>)

Social Sciences: 3 cr.

3 cr. from approved social sciences list: <http://www.cals.iastate.edu/student-services/social-sciences> (<http://www.cals.iastate.edu/student-services/social-sciences/>)

Ethics: 3 cr.

3 cr. from approved ethics list: <http://www.cals.iastate.edu/student-services/ethics> (<http://www.cals.iastate.edu/student-services/ethics/>)

Mathematical Sciences: 6 cr.

MATH 140	College Algebra	3
STAT 104	Introduction to Statistics	3

Physical Sciences: 8 cr.

CHEM 163 & 163L	College Chemistry and Laboratory in College Chemistry	5
One of the following:		
AGRON 259	Organic Compounds in Plants and Soils	3
BBMB 221	Structure and Reactions in Biochemical Processes	3
CHEM 231 & 231L	Elementary Organic Chemistry and Laboratory in Elementary Organic Chemistry	4

Life and Biological Sciences: 7 cr.

BIOL 212 & 212L	Principles of Biology II and Principles of Biology Laboratory II	4
AGRON 320 or BIOL 313	Genetics, Agriculture and Biotechnology or Principles of Genetics	3

Supporting Sciences: 15 cr.

Courses cannot be used to fulfill any other university, college, or Agronomy requirements. At least 9 cr. must be in courses numbered 300 or above.

This requirement can be met in one of three ways:

- Complete at least 3 credits in basic or mathematics-intensive discipline (ACCT, BBMB, BIOL, CHEM, COM S, ECON, All Engineering, GEOL, GEN, MATH, MTEOR, PHYS, STAT) as well as at least 6 additional credits in AN S, BIOL, BBMB, ENSCI, ENT, GEOL, HORT, GEN, MICRO, NREM, PL P, TSM. The other 6 credits can be a combination of the above department's courses and/or AGRON.
- Complete the courses needed to fulfill a certificate or second major that complements the student's academic and professional goals.
- By the end of the third semester before graduation, petition the Agronomy Curriculum Committee with a specific set of courses designed around "keeper of the land," "builder of genetic diversity," "explorer of plant life," "developer of bio-energy," "confronter of world hunger," or "designer of sustainable systems."

Agronomy Core: 44 cr.

AGRON 105	Leadership Experience	R
AGRON 110	Professional Development in Agronomy: Orientation	1
AGRON 180	Global Agriculture in a Changing World	3
AGRON 181	Introduction to Crop Science	3
AGRON 182	Introduction to Soil Science	3
AGRON 183	Basic Skills for Agronomists	1
AGRON 206	Introduction to Weather and Climate	3
AGRON 210	Professional Development in Agronomy: Career Planning	1
AGRON 279	Field Exploration of Agronomy	3
AGRON 280	Crop Development, Production and Management	3
AGRON 282	Soil Conservation and Land Use	3
AGRON 310 or AGRON 311	Professional Development in Agronomy: Work Experience or Professional Internship in Agronomy	R
AGRON 316	Crop Structure-Function Relationships	3
AGRON 342 or AGRON 450	World Food Issues: Past and Present or Issues in Sustainable Agriculture	3
AGRON 354 & 354L	Soils and Plant Growth and Soils and Plant Growth Laboratory	4
AGRON 360 or AGRON 392	Environmental Soil Science or Systems Analysis in Crop and Soil Management	3
AGRON 410	Professional Development in Agronomy: Senior Forum	1
Additional AGRON credits at the 300-400 level		6

Electives: 20 cr.

Additional free electives 20

Agronomy, B.S.

Freshman

Fall	Credits Spring	Credits
AGRON 110	1 AGRON 181	3
AGRON 180	3 AGRON 182	3
AGRON 183	1 BIOL 212	3
CHEM 163 or 177	4 BIOL 212L	1
CHEM 163L or 177L	1 ENGL 250	3
ENGL 150	3 Math or Social Sciences	3
LIB 160	1	
Math or Social Sciences	3	
17		16

Sophomore

Fall	Credits Spring	Credits
AGRON 206	3 AGRON 282	3
AGRON 210	1 AGEDS 311 or SP CM 212	3
AGRON 279	3 Organic Chemistry: AGRON 259, BBMB 221, OR CHEM 231 & L	3-4
AGRON 280	3 Elective	3
STAT 104	3 Supporting Sciences	3
Humanities	3	
16		15-16

Junior

Fall	Credits Spring	Credits
AGRON 316	3 AGRON 320 or BIOL 313	3
AGRON 354	3 AGRON 342 or 450	3
AGRON 354L	1 ENGL 302, 309, 312, or 314	3
Elective	6 International Perspectives	3
Supporting Sciences	3 Supporting Sciences (300+)	3
16		15

Senior

Fall	Credits Spring	Credits
Additional Agronomy credits (300+)	6 AGRON 360 or 392	3
Elective	5 AGRON 410	1
Ethics	3 Elective	6
U.S. Diversity	3 Supporting Sciences (300+)	6
17		16

Minor - Agronomy

A minor in agronomy is earned by taking 18 credits consisting of the following:

- 6 credits of required courses;
- 3-6 credits of foundation courses;
- 6-9 credits of supporting courses.

At least 9 credits must be taken at Iowa State University with at least 6 credits numbered 300 or above. The minor must include at least 9 credits that are not used to meet any other department, college, or university requirement.

A student may use up to:

- 3 credits of AGRON 496A or AGRON 496B;
- Or up to 2 credits from AGRON 331 or AGRON 370;

- Or up to 1 credit of AGRON 490.

Required Courses (6 credits):

AGRON 181	Introduction to Crop Science	3
AGRON 182	Introduction to Soil Science	3
Foundation Courses - One or two courses from the list below (3-6 credits):		
AGRON 180	Global Agriculture in a Changing World	3
AGRON 206	Introduction to Weather and Climate	3
AGRON 280	Crop Development, Production and Management	3
AGRON 282	Soil Conservation and Land Use	3

Supporting Courses (6-9 credits, 6 credits of which must be 300+ level):

AGRON 217	Weed Identification	1
AGRON 259	Organic Compounds in Plants and Soils	3
AGRON 270	Geospatial Technologies	3
AGRON 316	Crop Structure-Function Relationships	3
AGRON 317	Principles of Weed Science	3
AGRON 320	Genetics, Agriculture and Biotechnology	3
AGRON 334	Forage Crop Management	3
AGRON 338	Seed Science and Technology	3
AGRON 354	Soils and Plant Growth	3
AGRON 360	Environmental Soil Science	3
AGRON 392	Systems Analysis in Crop and Soil Management	3
AGRON 405	Soil-Plant-Animal-Atmosphere Physics	3
AGRON 421	Introduction to Plant Breeding	3
AGRON 450	Issues in Sustainable Agriculture	3
AGRON 459	Environmental Soil and Water Chemistry	4
AGRON 463	Soil Formation and Landscape Relationships	3
AGRON 477	Soil Physics	3
AGRON 484	Organic Agricultural Theory and Practice	3
AGRON 485	Soil and Environmental Microbiology	3
AGRON 497	Agroecology Field Course	3

SOIL SCIENCE CERTIFICATE**Purpose**

The certificate in soil science will prepare students with the skills needed for successful careers in the field of soil science. Soil science has key roles in achieving goals of sustainability as demonstrated by the functions of soil and their ecosystem services. Namely, soil is an important factor in addressing issues of food scarcity, water management, climate change, biodiversity loss, and human health. Students who complete the Iowa State University soil science certificate

program will qualify for federal employment as a soil scientist. In addition, students completing the certificate will have met the educational component of the Soil Science Society of America's requirements for certification as a professional soil scientist and all U.S. states' educational criteria for licensure as a professional soil scientist.

Requirements

The certificate in soil science requires the completion of 31 credit hours, including a foundation course in soil science, 15 credits in supporting biological, physical, or Earth sciences, as well as 13 credits from approved categories of soil science courses.

At least 9 credits must be taken in soil science courses numbered at the 300-level or above.

At least 9 credits used for the certificate cannot be used to meet any other department, college, or university requirement for the baccalaureate degree except to satisfy the total credit requirement for graduation and to meet credit requirements in courses numbered 300 or above.

Courses for the certificate cannot be taken on a pass/not-pass basis.

Course Requirements for Soil Science Certificate

Foundation: 3 credits of required core course.

AGRON 182	Introduction to Soil Science	3
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Supporting Biological, Physical, or Earth Sciences: Choose 15 credits from approved list consisting of courses from the following designators: A B E, AGRON, A ECL, BIOL, CHEM, C E, C R P, ENSCI, ENT, FOR, GEOL, HORT, L A, MTEOR, MICRO, NREM, PHYS.

Soil Science: Choose 13 credits with at least 2 credits from each of the following categories.

Soil Physical Properties or Soil Water Relationships (2 credits)		
AGRON 282	Soil Conservation and Land Use	3
AGRON 360	Environmental Soil Science	3
AGRON 405	Soil-Plant-Animal-Atmosphere Physics	3
AGRON 477	Soil Physics	3
A B E 431	Design and Evaluation of Soil and Water Conservation Systems	3
TSM 324	Soil and Water Conservation Management	3
Soil Chemistry (2 credits)		
AGRON 259	Organic Compounds in Plants and Soils	3
AGRON 459	Environmental Soil and Water Chemistry	4
Soil Biology (2 credits)		
AGRON 354	Soils and Plant Growth	3
AGRON 354L	Soils and Plant Growth Laboratory	1
AGRON 485	Soil and Environmental Microbiology	3

Soil Morphology and Geography (2 credits)

AGRON 270	Geospatial Technologies	3
AGRON 370	Field Experience in Soil Description and Interpretation	1
AGRON 463	Soil Formation and Landscape Relationships	3

The Soil Science Certificate may be earned at the same time as an ISU baccalaureate degree or after the completion of an associate of arts (AA) or associate of science (AS) degree or a baccalaureate degree from any accredited institution.

Information on the concurrent Agronomy bachelors degree and MBA can be located here (<https://www.ivybusiness.iastate.edu/full-time-concurrent-mba/>).

Graduate Study Introduction

Agronomy is the science and technology of producing plants that serve humans, using practices essential for maintaining and improving life. The Department of Agronomy administers Master of Science (MS) and Doctor of Philosophy (PhD) degree programs in four different graduate majors that emphasize different disciplines of agronomy. These majors are: Agricultural Meteorology; Crop Production and Physiology; Plant Breeding; and Soil Science. A fifth graduate major, Agronomy, offers both an MS and a Graduate Certificate through distance education suitable for professionals working in industry or government, as well as a graduate minor for on-campus students.

Admission

To be fully admitted, prospective graduate students must have an undergraduate GPA of at least a 3.00 GPA (4.00 scale) or rank in the upper one-half of their undergraduate class. Non-native English speakers must take the Test of English as a Foreign Language (TOEFL). Students applying to the Agricultural Meteorology and Plant Breeding graduate majors must take the Graduate Record Examination (GRE). For all of the majors except Agronomy, a faculty member of the graduate major must agree to be the major professor before the student is admitted.

Program of Study

The academic courses used to satisfy requirements for a graduate degree compose a student's Program of Study (POS). The POS must be approved by the student's POS Committee. For the MS in Agronomy, the POS Committee must be composed of at least two faculty who are both members of the Graduate Major in Agronomy. For the other four majors at the MS degree level, at least three faculty must serve on a POS Committee. Two of the three must be members of the major, and at least one must be a member of a different graduate major. At the PhD level the POS Committee must have at least five members, of which at least three must be faculty in the major, and at least one a member of a different

graduate major. If the student is pursuing a graduate minor, either as part of an MS or PhD, a graduate faculty member representing the minor must serve on the POS Committee.

Agronomy

The POS for the MS in Agronomy is fixed and consists of the following:

AGRON 501	Crop Growth and Development	3
AGRON 502	Chemistry, Physics, and Biology of Soils	3
AGRON 503	Climate and Crop Growth	3
AGRON 511	Crop Improvement	3
AGRON 512	Soil-Plant Environment	3
AGRON 513	Data Science for Agricultural Professionals	3
AGRON 514	Integrated Pest Management	3
AGRON 531	Crop Ecology and Management	3
AGRON 532	Soil Management	3
AGRON 533	Crop Protection	3
AGRON 591	Agronomic Systems Analysis	3
AGRON 592	Current Issues in Agronomy	3
AGRON 594	Agronomy MS Practicum	1
AGRON 599M	Agronomy (3 credits total over 2 semesters: 1 credit for proposal. 2 credits for final oral exam.)	†

† Arranged with instructor.

All Other Degrees

The courses in each student's POS will vary depending on the major and the student's interests. Only a maximum of three 400-level courses or one 300-level and two 400-level courses may be included on the POS. If a 300-level course is listed on the POS it cannot be an AGRON course.

Agricultural Meteorology

Students with a major in Agricultural Meteorology must include AGRON 698 in their POS. Students are encouraged to include the following courses: AGRON 505; MTEOR 605; a modeling course such as AGRON 518, AGRON 525, GEOL 516, or MTEOR 552; and a course in statistics.

Crop Production and Physiology

The Graduate Major in Crop Production and Physiology has defined five Core Areas.

Core Area 1 (molecular biology / biochemistry): BBMB 404, BBMB 405, BBMB 542A, BBMB 542B, BBMB 542C, BBMB 542D, BBMB 542E, BBMB 542F, BBMB 542G, and PLBIO 545.

Core Area 2 (growth and development): AGRON 525, AGRON 551, BIOL 454, BIOL 428, and GDCB 528.

Core Area 3 (plant physiology and metabolism): AGRON 508, AGRON 516, AGRON 519, AGRON 538, AGRON 553, AGRON 556, and PLBIO 513.

Core Area 4 (crop ecology and management): AGRON 509, AGRON 515, AGRON 530, AGRON 553, AGRON 556, AGRON 584, BIOL 485, BIOL 474, EEOB 584, EEOB 589, HORT 524, PL P 577, and PL P 594.

Core Area 5 (statistics / quantitative methods): AGRON 525, AGRON 526, STAT 587, STAT 505, STAT 512, STAT 588, C R P 551, and NREM 546.

To major in Crop Production and Physiology, at least one course from three of the Core Areas must be included in the POS for the MS. For the PhD, at least one course from each of the Core Areas must be included. A single course cannot be used for more than one Core Area. Students are also encouraged to consider AGRON 698.

Plant Breeding

The Graduate Major in Plant Breeding has both a resident and distance-education MS program. The following courses are recommended for students with a major in Plant Breeding: AGRON 521, AGRON 522, AGRON 523, AGRON 524, AGRON 528, AGRON 561, AGRON 600A, AGRON 698, STAT 587, and STAT 471. For the distance program, the following courses are recommended: AGRON 501, AGRON 506, AGRON 513, AGRON 520, AGRON 521, AGRON 523, AGRON 524, AGRON 528, AGRON 544, and AGRON 599. Resident students pursuing the PhD also often include AGRON 621 and AGRON 625 in their POS.

Soil Science

Students pursuing a major in Soil Science may specialize in one of six areas: soil chemistry; soil fertility; soil management; soil microbiology and biochemistry; soil morphology and genesis; or soil physics. If a specialization is chosen, the major professor must be in the designated specialty area. For the PhD, the POS must include one credit of AGRON 600B. Students are also encouraged to consider including AGRON 698 in their POS.

Master of Science

The general requirements for an MS degree include:

- a minimum of 30 credits from academic courses and research activities;
- at least 22 credits earned at ISU;
- two-thirds or more of earned credits related to the major; and
- completion of a final oral examination.

Both non-thesis and thesis options for an MS degree in Agricultural Meteorology, Crop Production and Physiology, Plant Breeding, and Soil Science are available. Students in the Agronomy major must choose the non-thesis option.

Students in Agricultural Meteorology working towards the MS must meet with their POS Committee at least twice. Besides the final oral examination, an additional meeting must be held near the beginning of the graduate program. At this meeting the student will introduce the area of research to be pursued, potential research questions and

methods, and a proposed POS. The student must also present a short written report on how the proposed research will help them master established Enduring Understandings in Agricultural Meteorology.

Creative Component

If the non-thesis MS degree is chosen, then the student must:

1. register for at least two credits of AGRON 599 that will be used to complete a creative component; and
2. pass a comprehensive final oral examination.

The creative component is work that presents substantial evidence of individual accomplishment. The POS Committee and the student will specify the creative component, how it will be documented, and how it will be evaluated. The POS Committee also has flexibility in determining the format of the final oral examination. For Agricultural Meteorology, the final oral exam must include an evaluation of the student's mastery of the Enduring Understandings in Agricultural Meteorology.

Thesis

In the thesis option the student must:

1. pursue a research project culminating in a written thesis; and
2. pass a comprehensive final oral examination.

A minimum of three research credits of AGRON 699 must be listed on the POS to account for work on an MS thesis. The thesis is submitted to the POS Committee prior to the final oral examination. During the final oral examination, the student will present and defend the thesis in the presence of the POS Committee. Students in Agricultural Meteorology must also demonstrate mastery of the Enduring Understandings in Agricultural Meteorology. The presentation (also called the "exit seminar") is open to the general public. Only POS Committee members may attend the examination that follows the presentation.

Doctor of Philosophy

The general requirements for a PhD degree include:

- a minimum of 72 credits from academic courses and research activities;
- at least 36 of these credits earned at ISU;
- completion of a preliminary oral examination;
- a written PhD dissertation; and
- completion of a comprehensive final oral examination.

The 72 credits can include the credits earned in pursuit of an MS degree. If an MS was earned at another institution, those courses earned at the other institution can be listed along with the ISU courses, but only if the POS Committee determines that the courses are appropriate. Students in Agricultural Meteorology working towards the PhD must meet with their POS Committee at least three times. Besides the final oral examination and another for the preliminary exam, an additional meeting must be held near the beginning of the graduate program. At this meeting the student

will introduce the area of research to be pursued, potential research questions and methods, and a proposed POS. If a student will pursue a PhD without first completing an MS, then during the first meeting of the POS Committee the student must also present a short written report that illustrates connections between the Enduring Understandings in Agricultural Meteorology and their planned research.

Qualification Exam

Agricultural Meteorology

Students in Agricultural Meteorology must take and pass a qualification exam once they have decided to pursue a PhD. The qualification exam must be passed before taking the preliminary exam. The format of the qualification exam is as follows. The student will produce a written report that demonstrates their knowledge of the Enduring Understandings in Agricultural Meteorology. If the student has come from another university the report must present research completed at ISU and not at the previous institution (such as a thesis). This report will be submitted to all of the faculty in the major. The student will then make an oral presentation to faculty and other students in the major that summarizes and defends the written report. After the oral presentation, the faculty will meet to determine whether or not the student passed the exam, and whether the student can re-take the exam if the student failed. The faculty will provide written feedback to the student, suggesting areas where improvement is needed and a course of action. The qualification exam can be taken only two times during a student's graduate career at ISU. If a student who had entered the PhD program without an MS degree takes the qualification exam and fails the exam, the student can: take the qualification exam again, if so allowed by the faculty; or continue their graduate career in pursuit of an MS degree. In the latter case, the student could take the qualification exam one more time after an MS degree has been completed.

All Other Majors

A qualification exam is not required for students in the Crop Production and Physiology, Plant Breeding, or Soil Science majors.

Preliminary Exam

All students pursuing a PhD must take and pass a preliminary oral examination.

Agricultural Meteorology

For students in Agricultural Meteorology the preliminary exam consists of a defense of the student's proposed dissertation research to the POS Committee. Besides an oral defense, the student must also submit a written report on their proposed research. If the student fails the preliminary exam, the POS Committee must also decide if the student can re-take the exam. The preliminary exam can only be taken twice.

Crop Production and Physiology

Students in Crop Production and Physiology may be asked to take a written preliminary examination. If a student fails the written preliminary

examination, the POS Committee may require the student to retake the exam, to answer additional written questions, or proceed with the oral examination. The nature of the preliminary oral exam is determined by the student's POS Committee.

Plant Breeding

Students in Plant Breeding must pass a uniform written preliminary examination that consists of five questions, each from one of five topical areas. Faculty members in Plant Breeding evaluate each answer. Evaluators assign a pass or fail grade to the answer. If an evaluator assigns a failing grade to a question, the evaluator shall clearly indicate the strengths and weaknesses of the answer and provide written information (e.g., references, rationale) to the student which clearly outlines an acceptable response to the question. Failure to provide such written information may invalidate that grade and be considered sufficient cause to exclude the grade in the overall evaluation of the student's answer. Students who receive two pass grades for a question will have successfully completed that topic, and students must pass each topic to pass the exam. If two valid grades are not in agreement (e.g., one passing grade and one failing grade), additional faculty members will evaluate the answer until there are two valid assessments that are in agreement. Students who do not pass a topic have the opportunity to repeat that topic on the next regularly scheduled exam date. The number of attempts for each topic has not been specified. The examination is offered the last Thursday and Friday of each January and September when one or more students have signed up to take the exam. Students may choose to attempt questions for all five topics, or for subsets of the topics. If a student decides to attempt questions for only certain topics, the student must specify which topics in writing at least one month prior to the scheduled exam date. The nature of the preliminary oral exam is determined by the student's POS Committee.

Soil Science

Students in Soil Science must pass a written preliminary examination. Exam questions are authored by members of the POS Committee. The format of each question is left open and they may be formulated as open- or closed-book problems. A reasonable period for completion may be set by the author of the question. The student's responses are formally scored or ranked only by the POS Committee member who authored the question. A copy of the student's responses to all questions is submitted to all POS Committee members at least one week before the student's preliminary oral examination. When the student submits a request to schedule the preliminary oral examination, the student's major professor certifies by signing the form that the student has satisfactorily completed a written preliminary exam. The nature of the preliminary oral exam is determined by the student's POS Committee.

Doctoral Dissertation and Final Oral Examination

All students must include at least three AGRON 699 credits in their POS for work on their PhD dissertation. During the required final oral examination, a student presents and defends the dissertation. This presentation (also called the "exit seminar") is open to the general public. Only POS Committee members may attend the examination that follows the presentation.

GRADUATE CERTIFICATE IN AGRONOMY FOR DISTANCE STUDENTS

The Graduate Certificate in Agronomy is for distance students and is comprised of the first six courses in the MS in Agronomy curriculum. All six courses are required for certificate completion.

AGRON 501	Crop Growth and Development	3
AGRON 502	Chemistry, Physics, and Biology of Soils	3
AGRON 503	Climate and Crop Growth	3
AGRON 511	Crop Improvement	3
AGRON 512	Soil-Plant Environment	3
AGRON 514	Integrated Pest Management	3
Total Credits		18

GRADUATE MINOR

On-campus students who wish to minor in Agronomy must include a core course from each of the other four graduate majors in their POS. These courses are:

AGRON 505	Soil-Plant-Animal-Atmosphere Physics	3
AGRON 516	Crop Physiology	3
AGRON 521	Principles of Cultivar Development	3
AGRON 553	Soil-Plant Relationships	3

However, one substitution is allowed with the approval of the faculty member serving as the minor representative on the POS Committee.