

AGRONOMY (AGRO)

AGRO 801 Biology of Plant Pathogens

Crosslisted with: PLPT 801, HORT 801

Prerequisites: PLPT 369 or equivalent; an introduction to biochemistry course

Description: Molecular and cellular approach to the study of plant pathological principles.

Credit Hours: 3

Max credits per semester: 3

Max credits per degree: 3

Grading Option: Grade Pass/No Pass Option

Prerequisite for: PLPT 866; PLPT 965, AGRO 965, HORT 965

AGRO 802 Ecology and Management of Plant Pathogens

Crosslisted with: PLPT 802, HORT 802

Prerequisites: PLPT 369 or equivalent; an introduction to biochemistry course

Description: Principles of plant disease epidemiology and disease control through cultural, biological, chemical and host plant resistance strategies.

Credit Hours: 3

Max credits per semester: 3

Max credits per degree: 3

Grading Option: Grade Pass/No Pass Option

Prerequisite for: PLPT 866; PLPT 965, AGRO 965, HORT 965

AGRO 803 Scientific Writing and Communication

Crosslisted with: PLAS 403, HORT 803

Prerequisites: Senior standing or higher, an ACE 1 written communication course, an ACE 2 oral communication course, and permission of instructor.

Description: Reading and critiquing, writing, and presenting scientific information. Use research data to compose a manuscript in standard scientific format, and prepare and present a poster to a general audience. Ethical issues in research and writing.

Credit Hours: 3

Max credits per semester: 3

Max credits per degree: 3

Grading Option: Graded

AGRO 804 Soil Science Research Methods

Description: Introduce soil's role in the ecosystem and soil science research methods with emphasis on identifying, describing, and measuring soil properties in the field and then discussing how those properties and their variability may affect plant, animal, insect, and/or microbial communities.

Credit Hours: 2

Max credits per semester: 2

Max credits per degree: 2

Grading Option: Grade Pass/No Pass Option

Offered: SPRING

AGRO 806 Plant Ecophysiology: Theory and Practice

Crosslisted with: HORT 806, NRES 406, NRES 806, PLAS 406

Prerequisites: Junior standing; 4 hrs ecology; and 4 hrs botany or plant physiology.

Description: Principles of plant physiology which underlie the relationship between plants and their physical, chemical and biotic environments. An introduction to the ecological niche, limiting factors and adaptation. An overview of the seed germination and ecology, plant and soil water relations, nutrients, plant energy budgets, photosynthesis, carbon balance and plant-animal interactions. An introduction to various field equipment used in ecophysiological studies.

Credit Hours: 4

Max credits per semester: 4

Max credits per degree: 4

Grading Option: Grade Pass/No Pass Option

AGRO 807 Plant-Water Relations

Crosslisted with: NRES 807

Prerequisites: AGRO 325 or equivalent; MATH 106 recommended

Description: Quantitative study of water relations in the soil-plant-atmosphere system. Basic physical processes, which describe the movement of water in the soil and the atmosphere, and the physiological processes, which describe water movement inside of the plant. Stomata physiology and the effects of internal water deficits on photosynthesis, respiration, nitrogen metabolism, cell division and cell enlargement. Results from integrative models used to study the relative importance of environmental versus physiological factors for several plant-environment systems.

Credit Hours: 3

Max credits per semester: 3

Max credits per degree: 3

Grading Option: Grade Pass/No Pass Option

Offered: FALL

AGRO 808 Microclimate: The Biological Environment

Crosslisted with: PLAS 408, GEOG 408, METR 408, NRES 408, WATS 408, GEOG 808, HORT 808, METR 808, NRES 808

Prerequisites: Junior standing, MATH 106 or equivalent, 5 hrs physics, major in any of the physical or biological sciences or engineering.

Description: Physical factors that create the biological environment. Radiation and energy balances of earth's surfaces, terrestrial and marine. Temperature, humidity, and wind regimes near the surface. Control of the physical environment through irrigation, windbreaks, frost protection, manipulation of light, and radiation. Applications to air pollution research. Instruments for measuring environmental conditions and remote sensing of the environment.

Credit Hours: 3

Max credits per semester: 3

Max credits per degree: 3

Grading Option: Grade Pass/No Pass Option

Prerequisite for: BSEN 954, NRES 954

AGRO 809A Case studies in plant breeding: Breeding for Disease Resistance**Crosslisted with:** PLAS 409A, HORT 809A**Notes:** A previous class in genetics is highly recommended.**Description:** The application of fundamental genetics principles in inheritance, gene mapping and DNA analysis to decision making by plant breeders with the goal of improving disease resistance in crop cultivars. Learning is structured by the genetics discovery story told in published research articles and the thinking process of plant breeders who will use these discoveries in their work.**Credit Hours:** 1**Max credits per semester:** 1**Max credits per degree:** 1**Grading Option:** Grade Pass/No Pass Option**Offered:** FALL/SPR**AGRO 809B Case Studies in plant breeding: Transgenic strategies for disease resistance****Crosslisted with:** PLAS 409B, HORT 809B**Description:** The application of basic science and technology by plant genetic engineering experts with the goal of teaming with plant breeders to improve disease resistance in crop cultivars. Learning is structured by the genetics discovery story told in published research articles and the thinking process of genetic engineers and plant breeders who will use these discoveries in their work.**Credit Hours:** 1**Max credits per semester:** 1**Max credits per degree:** 1**Grading Option:** Grade Pass/No Pass Option**Offered:** FALL/SPR**AGRO 810 Plant Molecular Biology****Crosslisted with:** BIOC 810, HORT 810**Prerequisites:** AGRO 215 or BIOS 206; BIOC 831**Description:** Molecular genetic basis of biological function in higher plants. Genome organization, gene structure and function, regulation of gene expression, recombinant DNA, and genetic engineering principles. Material taken primarily from current literature.**Credit Hours:** 3**Max credits per semester:** 3**Max credits per degree:** 3**Grading Option:** Grade Pass/No Pass Option**Offered:** SPRING**AGRO 811 Crop Genetic Engineering****Crosslisted with:** PLAS 411**Notes:** A previous class in genetics is highly recommended.**Description:** Basic steps required to produce genetically engineered crops, genetic engineering procedures used to develop current crops and innovations that will lead to future products, genetic engineering process and predicting how changes in different steps of the process influence the final crop, and application of genetic engineering technology to plan the development of new genetically engineered crops.**Credit Hours:** 2**Max credits per semester:** 2**Max credits per degree:** 2**Grading Option:** Grade Pass/No Pass Option**Offered:** FALL**AGRO 812 Crop and Weed Genetics****Crosslisted with:** PLAS 412**Notes:** A previous class in Genetics is highly recommended.**Description:** Application of classical and molecular genetic principles to the explanation of variation observed in plant families and populations. Interpretation of information gathered from whole plant trait observation and from molecular analysis. Relationships between crops and weeds. Examples from genetic studies on both crop and weed species are the basis of course.**Credit Hours:** 2**Max credits per semester:** 2**Max credits per degree:** 2**Grading Option:** Grade Pass/No Pass Option**Offered:** SPRING**AGRO 813 Turfgrass and Landscape Weed Management****Crosslisted with:** HORT 813, TLMT 813**Description:** Fundamental terminology associated with turfgrass and landscape weed management. Weed identification and the cultural practices and herbicide strategies to limit weed invasion and persistence.**Credit Hours:** 1**Max credits per semester:** 1**Max credits per degree:** 1**Grading Option:** Grade Pass/No Pass Option**AGRO 814 Turfgrass Disease Management****Crosslisted with:** HORT 814, PLPT 414, PLPT 814, PLAS 414, TLMT 814**Prerequisites:** BIOS/PLPT 369 or one semester of introductory plant pathology.**Description:** Pathogens, epidemiology, and control of diseases specific to turfgrass.**Credit Hours:** 1**Max credits per semester:** 1**Max credits per degree:** 1**Grading Option:** Grade Pass/No Pass Option**AGRO 815 Applied Plant Breeding and Genetics****Crosslisted with:** PLAS 415**Prerequisites:** PLAS 215 or BIOS 206**Notes:** For AGRO 815, a previous genetics course is highly recommended.**Description:** The goals for plant improvement, the theories plant breeders apply to make genetic improvement and the tools and methods that can be used to develop a plant breeding pipeline.**Credit Hours:** 3**Max credits per semester:** 3**Max credits per degree:** 3**Grading Option:** Grade Pass/No Pass Option**Offered:** SPRING**Course and Laboratory Fee:** \$40**AGRO 815A Self-pollinated Crop Breeding****Crosslisted with:** ENTO 815A**Prerequisites:** AGRO 215**Description:** Self-pollinated plant breeding theory and methods. Pedigree, bulk, single seed descent, back-crossing methods and inbreeding theory.**Credit Hours:** 1**Max credits per semester:** 1**Max credits per degree:** 1**Grading Option:** Grade Pass/No Pass Option**Prerequisite for:** AGRO 816B; AGRO 816E**Course and Laboratory Fee:** \$40

AGRO 815B Germplasm and Genes**Crosslisted with:** ENTO 815B**Prerequisites:** AGRO 215**Description:** Obtaining germplasm and genes from cultivated plants, wild relatives of cultivated plants, and the biosphere. Origination of crops, mutation genetics, biotechnology as a source of genes, chromosomal engineering and plant reproduction.**Credit Hours:** 1**Max credits per semester:** 1**Max credits per degree:** 1**Grading Option:** Grade Pass/No Pass Option**Prerequisite for:** AGRO 816B; AGRO 816E**Course and Laboratory Fee:** \$40**AGRO 815D Cross-pollinated Crop Breeding****Crosslisted with:** ENTO 815D**Prerequisites:** AGRO 215**Description:** Cross-pollinated breeding theory and methods. Genes in populations, recurrent selection methods, creating populations, hybrid production practices, and population improvement theory.**Credit Hours:** 1**Max credits per semester:** 1**Max credits per degree:** 1**Grading Option:** Grade Pass/No Pass Option**Prerequisite for:** AGRO 816B; AGRO 816E**Course and Laboratory Fee:** \$40**AGRO 816A Heterosis****Description:** Classical concepts of heterosis; genetic hypotheses for hybrid vigor; quantitative genetics of heterosis; new tools to study hybrid vigor, structure and function; organization of germplasm into heterotic groups; prediction of heterosis and hybrid performance; mechanisms for making hybrid seed; and breeding methods/concepts for developing hybrids in plants.**Credit Hours:** 1**Max credits per semester:** 1**Max credits per degree:** 1**Grading Option:** Grade Pass/No Pass Option**AGRO 816B Haploids and Doubled Haploids in Plant Breeding****Prerequisites:** AGRO 815A, B, and D**Description:** Variations in chromosome number, biology and technology of haploids/doubled haploids in higher plants, microspore embryogenesis, wide hybridizations, in vivo maize parthenogenesis-type, and radiation systems. Use of haploids in genetics research, DH systems in self-pollinated, cross-pollinated, and hybrid crop breeding.**Credit Hours:** 1**Max credits per semester:** 1**Max credits per degree:** 1**Grading Option:** Grade Pass/No Pass Option**AGRO 816E Genotype by Environment Interaction****Prerequisites:** AGRO 815A, B, and D, STAT 801A, 802 or equivalent course work**Description:** Types and causes of phenotype instability due to impacts of environmental factors. Topics include adaptation, impacts of G x E on selection and testing, selection of evaluation environments. Statistical concepts to describe/model interactions, breeding for reliability across unpredictable environments, precision phenotyping, selection for specific stresses, use of QTL's for abiotic and biotic stress stability.**Credit Hours:** 1**Max credits per semester:** 1**Max credits per degree:** 1**Grading Option:** Grade Pass/No Pass Option**Offered:** SPRING**AGRO 817 Plant Pathology Principles and Application****Crosslisted with:** PLPT 817, HORT 817**Prerequisites:** 12 hours of prior coursework in the plant sciences**Description:** Introduction to the biology of plant pathogenic organisms; pathogen-plant interactions; environmental influences; cultural, resistance, and chemical strategies for plant disease management.**Credit Hours:** 3**Max credits per semester:** 3**Max credits per degree:** 3**Grading Option:** Grade Pass/No Pass Option**AGRO 818 Agricultural Biochemistry****Crosslisted with:** BIOC 818**Prerequisites:** Undergraduate major in life sciences or related area, and a course in biochemistry**Description:** A Web-based course. Biochemical underpinnings of agricultural production and processing systems. Agricultural biotechnology; bioenergetics; kinetics and enzyme regulation; interaction of biomolecules with light, photosynthesis and the balance between anabolism and catabolism in microbes, plants and animals.**Credit Hours:** 2**Max credits per semester:** 2**Max credits per degree:** 2**Grading Option:** Grade Pass/No Pass Option**Prerequisite for:** VBMS 919**AGRO 819 Applications of Remote Sensing in Agriculture and Natural Resources****Crosslisted with:** PLAS 419, GEOG 419, GEOL 419, NRES 420, GEOG 819, GEOL 819, NRES 820**Notes:** GEOG 418/NRES 418 recommended**Description:** Introduction to the practical uses of remote electromagnetic sensing in dealing with agricultural and water-resources issues.**Credit Hours:** 4**Max credits per semester:** 4**Max credits per degree:** 4**Grading Option:** Grade Pass/No Pass Option**Course and Laboratory Fee:** \$35

AGRO 820 Bioinformatics Applications in Agriculture**Crosslisted with:** PLAS 420**Prerequisites:** PLAS 215 or equivalent. Undergraduate students must be at the senior class level standing.**Description:** Introduction to applied computational methods to analyze biological data, efficiently manipulate large data sets, and automate workflows. Learn strategies for assembling and analyzing data generated by modern high throughput sequencing platforms.**Credit Hours:** 3**Max credits per semester:** 3**Max credits per degree:** 3**Grading Option:** Grade Pass/No Pass Option**Offered:** FALL**AGRO 821 Learning Biotechnology****Crosslisted with:** HORT 821**Description:** Investigate biotechnology and its application in solving problems and connect biotechnology to basic science concepts in biology and chemistry. Integrate individually-designed biotechnology lessons into learning standards.**Credit Hours:** 3**Max credits per semester:** 3**Max credits per degree:** 3**Grading Option:** Grade Pass/No Pass Option**AGRO 822 Integrated Weed Management****Crosslisted with:** HORT 822**Prerequisites:** 12 hrs AGRO and/or closely related HORT and/or BIOS**Description:** Principles and application of (IWM). Noxious and invasive weed species. Crops and weed control. Plant population shifts. Use of herbicides and the biologically effective dose. Critical period of weed control and weed threshold. Herbicide tolerant crops.**Credit Hours:** 1**Max credits per semester:** 1**Max credits per degree:** 1**Grading Option:** Grade Pass/No Pass Option**AGRO 823X Production Systems****Crosslisted with:** HORT 823X**Notes:** One credit, fully online, graduate-level course emphasizes discussion and interpreting recommendations for a given situation. Finding, interpreting, and analyzing production recommendations are graduate-level skills.**Description:** Graduate level course in problem solving for various plant management situations through understanding the role of and interaction between soil, water, pests, genetics, and more. Through reading assignments and discussion activities, this course will focus on thinking about the interplay of various aspects of production systems as well as how external factors (e.g. wet spring, new insect pest) can affect various system components and management decisions.**Credit Hours:** 1**Max credits per semester:** 1**Max credits per degree:** 1**Grading Option:** Graded**Offered:** FALL**AGRO 824 Plant Nutrition and Nutrient Management****Crosslisted with:** HORT 824**Prerequisites:** AGRO 325 or basic course in plant physiology. A course in organic chemistry or biochemistry recommended**Notes:** Offered spring semesters.**Description:** Macro and micro nutrient elements and their function in the growth and development of plants. Role of single elements. Interaction and/or balances between elements and nutrient deficiency and/or toxicity symptoms as they affect the physiology of the whole plant. Relationship between crop nutrition and production and/or environmental considerations (e.g. yield, drought, temperature, pests).**Credit Hours:** 3**Max credits per semester:** 3**Max credits per degree:** 3**Grading Option:** Grade Pass/No Pass Option**AGRO 825 Cover Crops in Agroecosystems****Crosslisted with:** PLAS 425**Prerequisites:** PLAS 131 or PLAS 278 ; PLAS/SOIL 153 (or equivalent)**Description:** Explore the management, environmental, economic, and social considerations of cover crops across a diversity of agricultural production systems and regions. Grow cover crops, measure benefits and tradeoffs, and apply knowledge to make management and policy recommendations.**Credit Hours:** 3**Max credits per semester:** 3**Max credits per degree:** 3**Grading Option:** Graded**Offered:** FALL**AGRO 826 Invasive Plants****Crosslisted with:** PLAS 426, HORT 826, NRES 426, NRES 826**Prerequisites:** PLAS/SOIL 153; PLAS 131**Description:** Identification, biology and ecology of weedy and invasive plants. Principles of invasive plant management by preventative, cultural, biological, mechanical and chemical means using an adaptive management framework. Herbicide terminology and classification, plant-herbicide and soil-herbicide interactions, equipment calibration and dosage calculations.**Credit Hours:** 3**Max credits per semester:** 3**Max credits per degree:** 3**Grading Option:** Grade Pass/No Pass Option**Offered:** SPRING**AGRO 827 Turfgrass Systems Management****Crosslisted with:** PLAS 427, HORT 827, TLMT 827**Prerequisites:** PLAS 227 and PLAS 327**Description:** Critical evaluation of turfgrass settings to create economical and environmentally friendly management systems for professionally managed turf areas.**Credit Hours:** 3**Max credits per semester:** 3**Max credits per degree:** 3**Grading Option:** Grade Pass/No Pass Option**Course and Laboratory Fee:** \$50

AGRO 828 Scientific Illustration**Crosslisted with:** ENTO 828, AGRI 828, HORT 828**Prerequisites:** 12 hrs agricultural and/or biological sciences.**Description:** Prepare scientifically accurate, high quality illustrations and graphics for the teaching, presentation, and publication of scientific information. Drawing techniques, drafting, copyright, and publication and presentation of scientific art work.**Credit Hours:** 3**Max credits per semester:** 3**Max credits per degree:** 3**Grading Option:** Grade Pass/No Pass Option**Course and Laboratory Fee:** \$10**AGRO 829 Plant Biotechnology Applications****Crosslisted with:** PLAS 429**Prerequisites:** Faculty Permission**Description:** Application of plant biotechnology to answer biological questions. Development of writing and thinking skills with a working knowledge of plant biology and biotechnology. Learning in a lab focused setting to solidify skills used in molecular biology, biochemistry, cell biology, and computational biology.**Credit Hours:** 3**Max credits per semester:** 3**Max credits per degree:** 3**Grading Option:** Graded**Offered:** SPRING**Course and Laboratory Fee:** \$40**AGRO 829A Food Security: A Global Perspective****Crosslisted with:** PLAS 429A, HORT 829A, NRES 429A, NRES 829A, NUTR 429A, NUTR 829A**Prerequisites:** Junior standing**Description:** Overview of the technical and sociocultural dimensions of global food insecurity.**Credit Hours:** 3**Max credits per semester:** 3**Max credits per degree:** 3**Grading Option:** Grade Pass/No Pass Option**AGRO 831 Spatial Variability in Soils****Prerequisites:** AGRO/SOIL 366 and STAT 801.**Notes:** Offered spring semester of even-numbered years.**Description:** Basic concepts of soil variability, its underlying causes. The impact spatial variability has on soil management, primarily for crop production. Geographic and geo-statistical concepts. Use of spatial information for more profitable crop production.**Credit Hours:** 2**Max credits per semester:** 2**Max credits per degree:** 2**Grading Option:** Grade Pass/No Pass Option**AGRO 832 Learning Plant Science****Crosslisted with:** HORT 832**Description:** The biology of plants grown for food, fiber, fuel and fun. Connect applied plant science to basic science concepts in biology and chemistry. Integrate individually-designed plant science lessons into learning standards.**Credit Hours:** 3**Max credits per semester:** 3**Max credits per degree:** 3**Grading Option:** Grade Pass/No Pass Option**AGRO 833 Molecular Plant Breeding****Prerequisites:** Permission only**Description:** An introduction to current and emerging molecular biology technology and methods being used in crop breeding and their practical utilization in breeding programs.**Credit Hours:** 3**Max credits per semester:** 3**Max credits per degree:** 3**Grading Option:** Graded**Offered:** FALL**AGRO 834 Plant Biochemistry****Crosslisted with:** PLAS 434, BIOC 434, BIOS 434, CHEM 434, BIOC 834, BIOS 834, CHEM 834**Prerequisites:** BIOC/BIOS/CHEM 431/831.**Description:** Biochemical metabolism unique to plants. Relationships of topics previously acquired in general biochemistry to biochemical processes unique to plants. Biochemical mechanisms behind physiological processes discussed in plant or crop physiology.**Credit Hours:** 3**Max credits per semester:** 3**Max credits per degree:** 3**Grading Option:** Grade Pass/No Pass Option**AGRO 835 Agroecology****Crosslisted with:** PLAS 435, NRES 435, NRES 835**Prerequisites:** For PLAS/NRES 435: Senior standing. For AGRO/NRES 835: 12 hrs biological or agricultural sciences.**Description:** Integration of principles of ecology, plant and animal sciences, crop protection, and rural landscape planning and management for sustainable agriculture. Includes natural and cultivated ecosystems, population and community ecology, nutrient cycling, pest management, hydrologic cycles, cropping and grazing systems, landscape ecology, biodiversity, and socioeconomic evaluation of systems.**Credit Hours:** 3**Max credits per semester:** 3**Max credits per degree:** 3**Grading Option:** Grade Pass/No Pass Option**AGRO 836 Agroecosystems Analysis****Crosslisted with:** PLAS 436, HORT 836**Prerequisites:** Senior standing.**Notes:** Cost of travel required. Summer travel course with multi-state faculty. Farm visits to Iowa, Minnesota and Nebraska.**Description:** Analysis of production, economics, environmental impacts, and social integration aspects of farms and farming systems**Credit Hours:** 3**Max credits per semester:** 3**Max credits per degree:** 3**Grading Option:** Grade Pass/No Pass Option**AGRO 837 Animal, Food and Industrial Uses of Grain****Crosslisted with:** PLAS 437**Prerequisites:** CHEM 105A and CHEM 105L or CHEM 109A and 109L, and one of the following: PLAS 204 or ASCI 250.**Description:** Identification and comparison of grain quality characteristics desired by livestock feeders, human food processors and industrial users, and methods used to measure these characteristics.**Credit Hours:** 2**Max credits per semester:** 2**Max credits per degree:** 2**Grading Option:** Grade Pass/No Pass Option

AGRO 838 Producing Grain for Animal, Food and Industrial Uses**Crosslisted with:** PLAS 438**Prerequisites:** CHEM 109A and 109L and one of the following: PLAS 204 or ASCI 250.**Notes:** PLAS 215 and PLAS 437/837 recommended.**Description:** Genetic development, production practices, and grain handling and storage procedures to deliver quality grain to livestock feeders, human food processors and industrial uses.**Credit Hours:** 1**Max credits per semester:** 1**Max credits per degree:** 1**Grading Option:** Grade Pass/No Pass Option**AGRO 839 Organic Farming and Food Systems****Crosslisted with:** PLAS 439, HORT 839**Prerequisites:** 12 credits of agricultural or biological science, economics, or natural resources**Description:** History of organic farming and horticultural systems, organic certification, nutrient and pest management in organic systems, planning organic enterprises including production and marketing, resilience of organic systems in ecological, economic, and social terms; future issues and potentials of organic food systems.**Credit Hours:** 3**Max credits per semester:** 3**Max credits per degree:** 3**Grading Option:** Grade Pass/No Pass Option**AGRO 840 Great Plains Ecosystem****Crosslisted with:** PLAS 440, NRES 840, RNGE 440, NRES 440, GRAS 440**Prerequisites:** Junior standing.**Description:** Characteristics of Great Plains ecosystems, interrelationships of ecological factors and processes, and their application in the management of grasslands. Interactions of fire, vegetation, grazing animals and wildlife.**Credit Hours:** 3**Max credits per semester:** 3**Max credits per degree:** 3**Grading Option:** Grade Pass/No Pass Option**Offered:** SPRING**AGRO 841 Perennial Plant Function, Growth, and Development****Crosslisted with:** PLAS 441, HORT 841, RNGE 441, GRAS 441**Prerequisites:** PLAS 325 or equivalent.**Description:** Principles of crop physiology and developmental morphology in relation to function, growth, development, and survival of perennial forage, range, and turf plants. The relationship of physiology and morphological development on plant use and management.**Credit Hours:** 3**Max credits per semester:** 3**Max credits per degree:** 3**Grading Option:** Grade Pass/No Pass Option**Offered:** SPRING**AGRO 842 Wildland Plants****Crosslisted with:** PLAS 442, NRES 842, RNGE 442, NRES 442, GRAS 442**Prerequisites:** Junior standing.**Notes:** PLAS 131 or LIFE 121 and 121L or equivalent recommended**Description:** Wildland plants that are important to grassland and shrubland ecosystem management and production. Distribution, utilization, classification, identification (including identification by vegetative parts), uses by Native Americans, and recognition of grasses, forbs, shrubs, exotic and wetland plants.**Credit Hours:** 3**Max credits per semester:** 3**Max credits per degree:** 3**Grading Option:** Grade Pass/No Pass Option**Offered:** FALL**AGRO 843 Ecology of Invasive Species****Description:** Ecological principles and their application to invasive species. Discussion of population level characteristics and community and ecosystem level effects of a wide variety of taxa including invasive microbial, fungal, plant, invertebrate, and vertebrate examples. Current global consequences and governmental policies/programs designed to limit the spread of invasives.**Credit Hours:** 3**Max credits per semester:** 3**Max credits per degree:** 3**Grading Option:** Grade Pass/No Pass Option**AGRO 844 Ecosystem Monitoring and Assessment****Crosslisted with:** PLAS 444, NRES 844, RNGE 444, NRES 444, GRAS 444**Prerequisites:** Junior standing.**Notes:** NRES 220 or equivalent, recommended.**Description:** Measurement and monitoring of the important vegetation and environmental factors used to develop management guidelines in grasslands, savannas, woodlands, and wetlands. Emphasis on using ecosystem monitoring protocols for assessment of wildlife habitat, fuels management for wild-land fire, livestock production, and watershed function. Requires field sampling and travel to local field sites.**Credit Hours:** 3**Max credits per semester:** 3**Max credits per degree:** 3**Grading Option:** Grade Pass/No Pass Option**Offered:** FALL**AGRO 845 Livestock Management on Range and Pasture****Crosslisted with:** PLAS 445, ASCI 451, ASCI 851, RNGE 445, GRAS 445**Prerequisites:** ASCI 250 and PLAS 240 or PLAS 340**Notes:** AECN 201 recommended. Capstone course. All students required to participate in a one-week field trip in central or western Nebraska prior to beginning of fall semester. Therefore, students must notify instructor at time of early registration (Dates are given in class schedule.)**Description:** Analyzing the plant and animal resources and economic aspects of pasturage. Management of pasture and range for continued high production emphasized.**Credit Hours:** 3**Max credits per semester:** 3**Max credits per degree:** 3**Grading Option:** Grade Pass/No Pass Option**Offered:** FALL**Course and Laboratory Fee:** \$300

AGRO 846 Forage Quality**Crosslisted with:** ASCI 824**Prerequisites:** AGRO/RNGE 240 and ASCI 320, or equivalents; 3 cr hrs of introductory statistics; and permission**Description:** The chemical characteristics of forage components. The interactions with ruminant physiology and digestion that influence forage feeding value. The laboratory procedures used to evaluate forages for grazing livestock.**Credit Hours:** 3**Max credits per semester:** 3**Max credits per degree:** 3**Grading Option:** Grade Pass/No Pass Option**AGRO 847 Grassland Fire Ecology****Prerequisites:** BIOS 101 and 101L, or equivalent, recommended**Description:** Ecological effects of fire on grassland ecosystems. Insight into the history of fires, the people who use them and why, the parts of a fire, how fires behave in relation to fuel and weather, and the conducting and safety of prescribed burns**Credit Hours:** 3**Max credits per semester:** 3**Max credits per degree:** 3**Grading Option:** Grade Pass/No Pass Option**AGRO 848 Grassland Monitoring and Assessment****Prerequisites:** BIOS 101 and 101L; and AGRO 240, or their equivalents, recommended.**Description:** Vegetation sampling theory and plot selection. Quantitative measures used in vegetation analysis, root growth, and utilization. Similarity index, health, and trend for grassland monitoring and assessment. Use of basic statistics and the microcomputer to analyze data sets comparing methods for determination of biomass, basal cover, frequency, and density.**Credit Hours:** 2**Max credits per semester:** 2**Max credits per degree:** 2**Grading Option:** Grade Pass/No Pass Option**AGRO 849 Watershed Management in Grasslands****Prerequisites:** BIOS 101 and 101L; NRES 220; and AGRO 240, or their equivalents, recommended**Description:** Management of physical/biological settings and processes along with human activities on water and watersheds considering preventative and restorative strategies in a natural resource range-land setting.**Credit Hours:** 3**Max credits per semester:** 3**Max credits per degree:** 3**Grading Option:** Grade Pass/No Pass Option**AGRO 850 Climate and Society****Crosslisted with:** PLAS 450, GEOG 450, METR 450, NRES 452, GEOG 850, METR 850, NRES 852**Prerequisites:** Junior standing or above.**Notes:** Offered spring semester of even-numbered calendar years.**Description:** Impact of climate and extreme climatic events on society and societal responses to those events. Global in scope and interdisciplinary.**Credit Hours:** 3**Max credits per semester:** 3**Max credits per degree:** 3**Grading Option:** Grade Pass/No Pass Option**Offered:** SPRING**AGRO 851 Grassland Plant Identification****Prerequisites:** BIOS 101 and 101L; and AGRO 240, or their equivalents, recommended**Description:** Study of plants that have ecological and/or agricultural importance in the Great Plains. Plant identification, grassland ecosystems and plants forage value, palatability, and utilization by both domestic livestock and wildlife. Cultural and historical uses of grassland.**Credit Hours:** 2**Max credits per semester:** 2**Max credits per degree:** 2**Grading Option:** Grade Pass/No Pass Option**AGRO 852 Grazing Ecology and Management****Description:** This course discusses the ecological principles of domesticated livestock grazing and their application to manage grazing lands. Theoretical and applied models of plant/animals interactions will be presented. Grazing systems and their management of ecosystem services will be presented as balance between production and conservation outcomes.**Credit Hours:** 3**Max credits per semester:** 3**Max credits per degree:** 3**Grading Option:** Graded**AGRO 854 Specialty Crop Innovations****Crosslisted with:** PLAS 454, HORT 854**Prerequisites:** Junior standing; PLAS 100, 131, 153**Description:** Learn state-of-the-art, scale-appropriate methods for growing and marketing specialty crops like fruits, vegetables, and cut flowers in field and high-tunnel production systems. Test innovative products and systems of your own design to gain a competitive advantage in local markets.**Credit Hours:** 4**Max credits per semester:** 4**Max credits per degree:** 4**Grading Option:** Graded**Offered:** SPRING**AGRO 855 Soil Chemistry and Mineralogy****Crosslisted with:** PLAS 455, NRES 455, NRES 855, SOIL 455**Prerequisites:** PLAS/SOIL 153 or GEOL 101; CHEM 109A/L and CHEM 110A/L; CHEM 221 or CHEM 221A & CHEM 221L or 251.**Description:** Chemical and mineralogical properties of soil components. Inorganic colloidal fraction. Structures of soil minerals as a means of understanding properties, such as ion exchange and equilibria; release and supply of nutrient and toxic materials; and soil acidity and alkalinity. Forms and functions of organic matter in soil.**Credit Hours:** 3**Max credits per semester:** 3**Max credits per degree:** 3**Grading Option:** Grade Pass/No Pass Option**Offered:** SPRING

AGRO 858 Soil Physical Determinations**Crosslisted with:** PLAS 458, NRES 458, NRES 858, SOIL 458**Prerequisites:** SOIL/PLAS/GEOL/WATS 361; PHYS 141 or equivalent; MATH 102 or 103.**Description:** Survey of measurement techniques and principles used in characterizing the physical properties of soils. Includes analysis of experimental design and sources of experimental error. Techniques include: particle size analysis, soil water content, pore size analysis, field sampling techniques, soil strength, and saturated hydraulic conductivity.**Credit Hours:** 2**Max credits per semester:** 2**Max credits per degree:** 2**Grading Option:** Grade Pass/No Pass Option**AGRO 860 Soil Microbial Ecology****Crosslisted with:** PLAS 460, BIOS 460, NRES 460, SOIL 460, BIOS 860, NRES 860**Prerequisites:** Senior standing.**Notes:** Recommend having a strong science background, including courses from the agronomic, environmental, microbiology, engineering or medicine disciplines.**Description:** Soil from a microbe's perspective-growth, activity and survival strategies; principles governing methods to study microorganisms and biochemical processes in soil; mechanisms controlling organic matter cycling and stabilization with reference to C, N, S, and P; microbial interactions with plants and animals; and agronomic and environmental applications of soil microorganisms.**Credit Hours:** 3**Max credits per semester:** 3**Max credits per degree:** 3**Grading Option:** Grade Pass/No Pass Option**Offered:** SPRING**AGRO 861 Soil Physics****Crosslisted with:** PLAS 461, NRES 461, SOIL 461, WATS 461, NRES 861**Prerequisites:** PLAS/SOIL 153; PHYS 141 or equivalent, one semester of calculus.**Description:** Principles of soil physics. Movement of water, air, heat, and solutes in soils. Water retention and movement, including infiltration and field water regime. Movement of chemicals in soils.**Credit Hours:** 3**Max credits per semester:** 3**Max credits per degree:** 3**Grading Option:** Grade Pass/No Pass Option**AGRO 862 Cannabis Growth, Production and Breeding Basics****Crosslisted with:** PLAS 462, HORT 862**Prerequisites:** PLAS 131 or LIFE 121; PLAS 215 or BIOS 206**Notes:** PLAS 221 recommended**Description:** History, breeding and production of cannabis for medicinal marijuana and hemp for fiber use when grown using a growth room, greenhouse, high tunnel and/or field. Clarification between scientific evidence and casual information.**Credit Hours:** 2**Max credits per semester:** 2**Max credits per degree:** 2**Grading Option:** Graded**Offered:** FALL/SPR**AGRO 869 Bio-Atmospheric Instrumentation****Crosslisted with:** GEOG 469, PLAS 407, METR 469, AGST 469, NRES 469, GEOG 869, HORT 807, METR 869, AGST 869, NRES 869**Prerequisites:** Junior standing; MATH 106; 4 hrs physics; physical or biological science major.**Description:** Discussion and practical application of principles and practices of measuring meteorological and related variables near the earth's surface including temperature, humidity, precipitation, pressure, radiation and wind. Performance characteristics of sensors and modern data collection methods are discussed and evaluated.**Credit Hours:** 3**Max credits per semester:** 3**Max credits per degree:** 3**Grading Option:** Grade Pass/No Pass Option**AGRO 872 Applied Soil Physics****Crosslisted with:** PLAS 472, NRES 472, NRES 872, SOIL 472, WATS 472**Prerequisites:** PLAS/SOIL 153; MATH 102 or MATH 104 or MATH 106.**Description:** Emphasis on applied soil physics. Discussion of theoretical principles followed by field and laboratory exercises and applications. Fluxes of water, solutes, air, and heat through the soil. Emphasis on water infiltration, water retention, other soil hydraulic properties. Components of soil water balance. Management of soil water.**Credit Hours:** 3**Max credits per semester:** 3**Max credits per degree:** 3**Grading Option:** Grade Pass/No Pass Option**Offered:** FALL**AGRO 875 Water Quality Strategy****Crosslisted with:** NRES 475, NRES 875, SOIL 475, WATS 475, PLAS 475, CIVE 475, CIVE 875, CRPL 475, CRPL 875, GEOL 475, GEOL 875, AGST 475, AGST 875, POLS 475, POLS 875**Prerequisites:** Senior standing.**Notes:** Capstone course.**Description:** Holistic approach to the selection and analysis of planning strategies for protecting water quality from nonpoint sources of contamination. Introduction to the use of methods of analyzing the impact of strategies on whole systems and subsystems; for selecting strategies; and for evaluating present strategies.**Credit Hours:** 3**Max credits per semester:** 3**Max credits per degree:** 3**Grading Option:** Grade Pass/No Pass Option**AGRO 878 Plant Anatomy****Crosslisted with:** BIOS 478, BIOS 878, PLAS 478, HORT 878**Prerequisites:** 8 hrs biological sciences**Description:** Development, structure, and function of tissues and organs of the higher plants. Relationships of structure to physiology and ecology of plants.**Credit Hours:** 4**Max credits per semester:** 4**Max credits per degree:** 4**Grading Option:** Grade Pass/No Pass Option

AGRO 880 Modified Root Zones**Crosslisted with:** PLAS 480, TLMT 880, HORT 880**Prerequisites:** PLAS 153/SOIL 153**Notes:** Recommend CHEM 105A/CHEM 105L or CHEM 109A/CHEM 109L, PLAS 131, PLAS 227, and PLAS 453 or PLAS 472**Description:** Modified root zones and their applications in the turfgrass and landscape management industry. Correct applications and construction techniques.**Credit Hours:** 1**Max credits per semester:** 1**Max credits per degree:** 1**Grading Option:** Grade Pass/No Pass Option**Offered:** SPRING**AGRO 884 Water Resources Seminar****Crosslisted with:** PLAS 484, GEOG 484, GEOL 484, NRES 484, WATS 484, NRES 884, GEOG 884, GEOL 884, WATS 884**Prerequisites:** Junior or above standing**Description:** Seminar on current water resources research and issues in Nebraska and the region.**Credit Hours:** 1**Max credits per semester:** 1**Max credits per degree:** 1**Grading Option:** Grade Pass/No Pass Option**AGRO 888 Entrepreneurship and Enterprise Development****Crosslisted with:** PLAS 488, HORT 888, EAEP 488, ENTR 488, EAEP 888, ENTR 888, ABUS 488**Description:** The process of starting your own enterprise. Competitive environment, risk management, finance for business startups, funding, and business plan writing.**Credit Hours:** 3**Max credits per semester:** 3**Max credits per degree:** 3**Grading Option:** Grade Pass/No Pass Option**Offered:** FALL/SPR**AGRO 889 Urbanization of Rural Landscapes****Crosslisted with:** PLAS 489, CRPL 489, HORT 889, CRPL 889**Prerequisites:** Senior standing or graduate standing.**Description:** Development converts rural landscapes into housing, roads, malls, parks, and commercial uses. This process fragments landscapes and changes ecosystem functions, drives up land prices, and pushes agriculture into more marginal areas. This multi-disciplinary, experiential course guides students in learning about the urbanization process, the impacts on landscapes, people, and the community, and the choices that are available to informed citizens.**Credit Hours:** 3**Max credits per semester:** 3**Max credits per degree:** 3**Grading Option:** Grade Pass/No Pass Option**AGRO 894 Graduate Degree Project Credits****Crosslisted with:** HORT 894**Prerequisites:** Admission to Master of Agronomy or Horticulture degree program**Notes:** Project activity for the nonthesis option II MS degree.**Description:** Design, develop and complete a project that requires synthesis of the course topics covered in the primary area of emphasis.**Credit Hours:** 1-6**Min credits per semester:** 1**Max credits per semester:** 6**Max credits per degree:** 6**Grading Option:** Pass No-Pass**AGRO 896 Independent Study****Crosslisted with:** PLAS 496, RNGE 496, SOIL 496**Credit Hours:** 1-6**Min credits per semester:** 1**Max credits per semester:** 6**Max credits per degree:** 12**Grading Option:** Grade Pass/No Pass Option**Course and Laboratory Fee:** \$50**AGRO 897 Master of Applied Science Project****Crosslisted with:** AGRI 897, HORT 897, NRES 897, ASCI 897**Prerequisites:** Admission to Master of Applied Science degree program**Notes:** Project activity for the Master of Applied Science degree.**Description:** Design, develop and complete a project that requires synthesis of the course topics covered in the primary area of emphasis.**Credit Hours:** 1-6**Min credits per semester:** 1**Max credits per semester:** 6**Max credits per degree:** 6**Grading Option:** Grade Pass/No Pass Option**AGRO 899 Masters Thesis****Prerequisites:** Admission to masters degree program and permission of major adviser.**Notes:** P/N only.**Credit Hours:** 1-10**Min credits per semester:** 1**Max credits per semester:** 10**Max credits per degree:** 99**Grading Option:** Pass No-Pass**AGRO 902 Foundations of Ecological Resilience****Crosslisted with:** NRES 902**Prerequisites:** Graduate standing**Description:** Concept of resilience, especially ecological resilience, and resilience theory. Both theoretical and applied aspects of ecological resilience, and the development of resilience theory. Prominent issues in resilience science and applications to practical problems in natural resource management.**Credit Hours:** 3**Max credits per semester:** 3**Max credits per degree:** 3**Grading Option:** Graded**Offered:** FALL**Groups:** Biology, Psychology, & Politics American Government & Public Pol**AGRO 906 Crop Growth and Yield Modeling****Crosslisted with:** NRES 906**Prerequisites:** AGRO 325/HORT 325 Introductory Plant Physiology or equivalent**Notes:** Recommended: AGRO 406/806 NRES 406/806 HORT 406/806 Plant Ecophysiology or equivalent.**Description:** Understanding and use of crop simulation models and ability to build crop models. Studying principles and quantitative descriptions of crop production ecology. Offered fall semester of odd-numbered calendar years.**Credit Hours:** 3**Max credits per semester:** 3**Max credits per degree:** 3**Grading Option:** Grade Pass/No Pass Option

AGRO 919 Advanced Crop Genetics and Genomics**Crosslisted with:** HORT 919**Prerequisites:** AGRO 215**Description:** Focus student learning on principles related to mendelian, population, and molecular genetics of plants including allelisms, nonallelic gene interaction, linkage and recombination, mode of inheritance, mutation, epigenetics, DNA-based makers and mapping techniques, inheritance of qualitative and quantitative traits, and plant transformation.**Credit Hours:** 3**Max credits per semester:** 3**Max credits per degree:** 3**Grading Option:** Grade Pass/No Pass Option**Offered:** FALL**AGRO 931 Population Genetics****Crosslisted with:** ASCI 931, HORT 931**Prerequisites:** AGRO 215 and STAT 801A**Description:** Structure of populations, forces affecting gene frequency and frequency of genotypes, continuous variation, population values and means, genotypic and environmental variances and covariances.**Credit Hours:** 3**Max credits per semester:** 3**Max credits per degree:** 3**Grading Option:** Grade Pass/No Pass Option**Offered:** SPRING**Prerequisite for:** AGRO 932, STAT 847; ASCI 932; ASCI 933; ASCI 944, STAT 844**AGRO 932 Biometrical Genetics and Plant Breeding****Crosslisted with:** STAT 847**Prerequisites:** AGRO 931**Notes:** STAT 802 recommended. Offered odd-numbered calendar years.**Description:** Theoretical concepts involved in planning breeding programs for the improvement of measurable morphological, physiological, and biochemical traits that are under polygenic control in crop plants of various types.**Credit Hours:** 3**Max credits per semester:** 3**Max credits per degree:** 3**Grading Option:** Grade Pass/No Pass Option**AGRO 940 Forage Evaluation****Crosslisted with:** ASCI 924**Prerequisites:** Permission**Description:** Offered even-numbered calendar years. Analytic procedures and research methods used in evaluating biochemical components and nutritive value of forages. An evaluation of the impact of forage quality on forage breeding and animal performance.**Credit Hours:** 3**Max credits per semester:** 3**Max credits per degree:** 3**Grading Option:** Grade Pass/No Pass Option**AGRO 963 Genetics of Host-Parasite Interaction****Crosslisted with:** HORT 963, PLPT 963**Prerequisites:** BIOS 820; and permission**Credit Hours:** 3**Max credits per semester:** 3**Max credits per degree:** 3**Grading Option:** Graded**AGRO 965 Plant Virology****Crosslisted with:** PLPT 965, HORT 965**Prerequisites:** PLPT 801 or 802; and permission.**Notes:** PLPT 865 is offered odd-numbered calendar years.**Description:** Virus molecular biology; virosphere; virus-vector relationships; plant resistance to virus infection economic impact and control of plant diseases by viruses.**Credit Hours:** 3**Max credits per semester:** 3**Max credits per degree:** 3**Grading Option:** Grade Pass/No Pass Option**Offered:** SPRING**AGRO 968 Seminar in Plant Pathology****Crosslisted with:** PLPT 968, HORT 968**Prerequisites:** Permission.**Credit Hours:** 1**Max credits per semester:** 1**Max credits per degree:** 1**Grading Option:** Grade Pass/No Pass Option**Offered:** SPRING**AGRO 985 Soil Carbon and Nitrogen Dynamics****Crosslisted with:** NRES 985, SOIL 985**Notes:** Basic knowledge about soil biogeochemical characteristics and processes are required to take full advantage of the content delivered. Recommended courses: AGRO/SOIL 153 or AGRO 804, AGRO/SOIL 455/855, GEOL 417/817.**Description:** Understand carbon and nitrogen cycling in the soil ecosystem including feedbacks and implications for soil management, environment, and climate.**Credit Hours:** 3**Max credits per semester:** 3**Max credits per degree:** 3**Grading Option:** Graded**Offered:** FALL/SPR**AGRO 991 Seminar Presentation and Evaluation****Crosslisted with:** HORT 991**Description:** Various topics in horticulture, agronomy or related subjects. Emphasis on techniques.**Credit Hours:** 1**Max credits per semester:** 1**Max credits per degree:** 2**Grading Option:** Grade Pass/No Pass Option**AGRO 992 General Seminar****Crosslisted with:** HORT 992, NRES 992**Prerequisites:** Permission**Notes:** Agronomy and Horticulture PhD students should enroll in this course twice.**Description:** Expected of all Agronomy and Horticulture graduate students. Presentation of thesis/dissertation or non-thesis topics in agronomy, horticulture or related subjects. Agronomy and Horticulture PhD students should enroll in this course twice.**Credit Hours:** 1**Max credits per semester:** 1**Max credits per degree:** 5**Grading Option:** Pass No-Pass

AGRO 996 Research in Crops

Prerequisites: 12 hrs agronomy or closely related sciences and permission

Credit Hours: 2-5

Min credits per semester: 2

Max credits per semester: 5

Max credits per degree: 5

Grading Option: Grade Pass/No Pass Option

AGRO 996A Research in Soils

Crosslisted with: NRES 996A

Prerequisites: 12 hrs AGRO or closely related sciences, and permission

Credit Hours: 2-5

Min credits per semester: 2

Max credits per semester: 5

Max credits per degree: 5

Grading Option: Grade Pass/No Pass Option

AGRO 999 Doctoral Dissertation

Crosslisted with: HORT 999

Prerequisites: Admission to doctoral degree program and permission of supervisory committee chair.

Notes: AGRO 999 is pass/no pass only.

Credit Hours: 1-24

Min credits per semester: 1

Max credits per semester: 24

Max credits per degree: 99

Grading Option: Pass No-Pass