CROP AND SOIL SCIENCES CSS

Department of Plant, Soil and Microbial Sciences
College of Agriculture and Natural Resources

101 Introduction to Crop Science
Fall, Spring. 3(3-0) R: Open to undergraduate students or agricultural technology students.
Principles of crop production including integrated crop management. Sustainable agriculture. International agriculture. Environmental challenges to crop production.

101L Introduction to Crop Science Laboratory
Fall. 1(0-2) P: CSS 101 or concurrently R: Open to undergraduate students or agricultural technology students.
Identification of crops, seeds, plant structures; plant nutrient deficiency symptoms; crop growth stages and environmental stresses including pests, nutrients, drought, and temperature. Field trips required.

105 Agricultural Industries Seminar
Fall. 1(2-0) R: Open to agricultural technology students in the Agricultural Industries Major. SA: AEE 105
Preparation for academic and professional success. Introduction to opportunities in the agriculture industry.

110 Computer Applications in Agronomy
Fall. 2(1-2) R: Open to undergraduate students or agricultural technology students in the College of Agriculture and Natural Resources. Not open to students with credit in CSE 101.
Use of computers in agriculture. Basic computer operating systems. Management and use of storage media. Laboratory experience in word processing, spreadsheets, databases, programming languages, networking, and software related to agriculture.

120 Issues in Food and Agriculture
Fall. 3(3-0) R: Open to undergraduate students or agricultural technology students.
Current and historical issues impacting food and agriculture.

124 Introduction to Sustainable Agriculture and Food Systems
Fall, Spring. 2(2-0) Interdepartmental with Animal Science and Community Sustainability and Horticulture. Administered by Crop and Soil Sciences. R: Open to undergraduate students or agricultural technology students.
Contemporary research and movements involving agricultural and food system sustainability. Sociocultural factors influencing food and agriculture.

126 Introduction to Weed Management
Fall. 2(2-0) P: CSS 101 or CSS 232 or HRT 109 R: Open to students in the Institute of Agricultural Technology. SA: CSS 156
Biology, identification, and management of weeds.

135 Crop Scouting and Investigation
Spring. 3(4-0) Interdepartmental with Horticulture. Administered by Crop and Soil Sciences. P: CSS 101 or HRT 203 RB: CSS 101L R: Open to undergraduate students or agricultural technology students.
Crop scouting and agricultural clientele interactions for improved crop management. Offered first ten weeks of semester.

143 Introduction to Soil Science
Fall, Spring. 2(2-0) Fall: W. K. Kellogg Biological Station and Grand Rapids and Traverse City. R: Open to agricultural technology students in the Institute of Agricultural Technology. Not open to students with credit in CSS 210.
Soil and its impact on plant growth, plant and water relations, drainage, nutrients, soil as a resource, and erosion control techniques.

151 Seed and Grain Quality
Spring. 2(2-2) R: Open to undergraduate students or agricultural technology students. SA: CSS 051
Principles and practices of producing, conditioning, testing and marketing field crop seed. Grain grading and quality evaluation. Offered first ten weeks of semester.

171 Operations Budgeting for Golf Course Managers
Spring. 2(3-0) RB: CSS 232 and CSS 210 SA: CSS 071
Budgeting. Financial analysis. Purchasing and materials management for golf course operations. Offered first ten weeks of semester.

178 Turfgrass Irrigation
Spring. 3(3-2) P: CSS 232
Turfgrass irrigation systems. Installation and maintenance including water management. Offered first ten weeks of semester.

181 Pesticide and Fertilizer Application Technology
Spring. 3(3-3) SA: CSS 081
Effective and efficient application of pesticides and fertilizers to turf and ornamentals. Pesticide handling, legal, and environmental concerns. Calibration of equipment. Offered first ten weeks of semester.

192 Professional Development Seminar I
Fall. 1(0-2) R: Open to students in the Department of Plant, Soil and Microbial Sciences.
Career development, critical issues analysis, resume writing, scientific presentations and public speaking in crop and soil sciences.

201 Forage Crops
Fall. 3(2-2) R: Open to undergraduate students or agricultural technology students.
Forage crop production, management, and utilization; crop identification; soil fertilization; planting and harvesting of grasses and legumes.

202 World of Turf
Fall, Spring, Summer. 2(2-0) Not open to students with credit in CSS 232.
Role of turf in society and the environment. Principles underlying establishment and maintenance of turf on athletic fields, parks, home lawns, and golf courses. Aesthetic, safety, and economic aspects of turfgrass management practices.

202L World of Turf Lab
Fall, Spring, Summer. 1(0-2) P: CSS 202 or concurrently Not open to students with credit in CSS 232.
Turfgrass identification. Site analysis and recommendations. On campus facility and venue visits. Mowing equipment and practices. Turf establishment. Soil cultivation and amendments. Fertilizer and pest management. Field trips required.

210 Fundamentals of Soil Science
Fall, Spring. 3(2-3) RB: CEM 141 R: Open to undergraduate students or agricultural technology students.
Agricultural and natural resource ecosystems: soil, vegetation, and ground water components. Energy, water, and nutrient cycles. Soil classification and mapping. Land management and use issues.

212 Advanced Crop Production
Fall. 2(2-0) P: CSS 101 RB: CSS 210 and CSS 110 R: Open to undergraduate students or agricultural technology students.
Systems approach to production of field crops including corn, soybeans, small grains, sugar beets, and dry beans.

222 New Horizons in Biotechnology
Fall. 2(2-0) R: Open to undergraduate students or agricultural technology students.
Perspectives on biotechnology for safer food production, environmental quality, and improved human health. Impacts of biotechnology on the national economy. Political and ethical ramifications of applied biotechnology.

224 Sustainable Farm and Food Systems Field Studies
Fall. 1(0-4) Interdepartmental with Animal Science and Community Sustainability and Horticulture. Administered by Crop and Soil Sciences. P: CSS 124 R: Not open to freshmen or agricultural technology students.
Field visits to farm and food system operations that utilize sustainable practices in Michigan. Offered first half of semester.

226L Weed Science Laboratory
Fall. 1(0-2) P: ((CSS 126 or concurrently) or (CSS 326 or concurrently)) and (CSS 101 or CSS 232 or HRT 203 or HRT 109) SA: CSS 156, CSS 302, CSS 402
Weed and weed seed collection and identification. Mechanical and chemical tools involved in managing weeds. Herbicide application and calibration. Weed and crop selectivity, crop injury symptoms.

232 Turfgrass Management
Fall. 4(3-2) P: CSS 210 or concurrently RB: CSS 110 or CSE 101
Turfgrass utilization, identification, establishment and management principles. Responses to various cultural practices.

251 Organic Farming Principles and Practices
Spring. 3(3-0) Interdepartmental with Horticulture. Administered by Horticulture.
History and principles of organic farming. Farms as ecological systems. Certification process and agencies. Organic matter management, the soil food web, and nutrient availability. Biodiversity, crop rotations, plant competition, ground cover, and plant health. Integrating crops and animals. Organic animal husbandry. Field trip required.

262 Turfgrass Management Seminar
Fall. 1(2-0) A student may earn a maximum of 2 credits in all enrollments for this course. P: CSS 232 or concurrently
Presentations by turf students and industry professionals. Topics include internship experiences, technical expertise, and keys to successful career pathways.

264 Golf Course Design and Construction Techniques
Fall. 2(2-0) P: CSS 210 and CSS 232 and CSS 267 SA: CSS 164
Concepts and theory of golf course design and construction including location, space, topography, clientele, and environmental concerns.

267 Performance Turf Design and Construction
Spring. 2(2-2) P: CSS 232
Performance turfgrass design, construction, renovation and establishment principles.

269 Turfgrass Strategies: Integration and Synthesis
Spring. 2(3-0) P: CSS 232 and CSS 267
Issues in turfgrass management including employee relations, cultural, and environmental problems. Offered first ten weeks of semester.

272 Turfgrass Soil Fertility
Spring. 2(3-0) RB: CSS 210 SA: CSS 044, CSS 342
Soil-plant relationships, soil acidity and alkalinity, macro- and micro-nutrients, fertilizer materials, soil fertility, evaluations, and fertilizer programming. Offered first ten weeks of semester.

282 Turfgrass Physiology
Spring. 2(3-0) P: (CSS 232) Completion of Tier I writing requirement. RB: PLB 105 SA: CSS 382, CSS 068, CSS 332
Physiological principles of turfgrass growth and development. Water relations, light, temperature, respiration, photosynthesis, mineral nutrition, and hormone action. Impact of mowing, cultivation, and traffic on turfgrass growth. Offered first ten weeks of semester.

290 Independent Study in Crop and Soil Science
Fall, Spring, Summer. 1 to 4 credits. A student may earn a maximum of 6 credits in all enrollments for this course. R: Open to students in the Institute of Agricultural Technology. Approval of department; application required. SA: CSS 057
Field, laboratory, or library research problems.

294 Issues in International Agriculture
Spring. 1(1-0) P: Completion of Tier I Writing Requirement R: Open to undergraduate students or agricultural technology students. SA: CSS 494
Global issues related to food production, soil resources and sustainability of agriculture in developing and developed countries.

313 Data Interpretation and Writing in the Agronomic Sciences
Spring. 2(2-0) P: (CSS 110 and CSS 210) and (CSS 101 or CSS 232) R: Not open to freshmen.
Data analysis, interpretation, integration, and technical writing in agronomic sciences.

326 Weed Science
Fall. 2(2-0) P: CSS 101 or CSS 232 or HRT 203 R: Not open to students in the Institute of Agricultural Technology. SA: CSS 302, CSS 402
Weed biology and ecology. Integrated weed management including cultural, mechanical, biological, and chemical control practices. Herbicide mode of action, selectivity in plants, environmental considerations.

330 Soil Chemistry
Spring. 2(2-2) P: CSS 210 and CEM 141
Organic and inorganic soil processes including mineralogy, adsorption, desorption, and precipitation. Chemistry of soil organic matter and inorganic soil components.

331 Water Management in Agriculture and Food Systems
Spring. 3(3-0) Interdepartmental with Technology Systems Management. Administered by Technology Systems Management. P: MTH 103 or MTH 124 or MTH 132 or LB 118 SA: TSM 431
Principles of water management, use efficiency and conservation in agricultural production, natural resources and food processing facilities. Best agricultural water management practices, water rights, irrigation scheduling, irrigation systems selection, evaluation and management and drainage principles. Large scale water use, management and conservation in food processing.

340 Applied Soil Physics
Spring. 2(2-2) P: CSS 210
Soil physical properties including solids, water, air, and heat. Transport processes in soil.

343 Principles of Precision Agriculture
Fall. 3(2-2) Interdepartmental with Technology Systems Management. Administered by Technology Systems Management. P: MTH 103 or MTH 114 or MTH 116 or MTH 124 or MTH 132
Global positioning systems (GPS), yield monitors, and computer software. Analysis and interpretation of field maps. Variable-rate application. Economics of precision agriculture.

350 Introduction to Plant Genetics
Spring. 3(4-0) P: PLB 105 or BS 161 R: Not open to freshmen.
Fundamentals of plant genetics with applications to agriculture and natural resources.

360 Soil Biology
Fall. 3(2-2) P: CSS 210 RB: CSS 330
Overview of organismal diversity and biological soil processes. Role of macroorganisms and microorganisms in soil processing, including nutrient cycling.

424 Sustainable Agriculture and Food Systems: Integration and Synthesis
Fall. 3(3-0) Interdepartmental with Animal Science and Community Sustainability and Horticulture. Administered by Crop and Soil Sciences. P: CSS 124 and (CSS 224 or concurrently) R: Open to juniors or seniors or graduate students.
Biogeochemical and socio-economic aspects of food, fiber, and fuel production. Environmental impacts and social context. Experiential learning projects.

425 Microbial Ecology
Spring. 3(3-0) Interdepartmental with Microbiology and Molecular Genetics. Administered by Microbiology and Molecular Genetics. RB: MMG 301 SA: MPH 425
Microbial population and community interactions. Microbial activities in natural systems, including associations with plants or animals.

431 International Agricultural Systems
Spring. 3(3-0) P: (ANR 250 or ISS 310 or ISS 315 or ISS 318 or ISS 320 or ISS 330A or ISS 330B or ISS 330C or ISS 336) and completion of Tier I writing requirement R: Not open to freshmen.
World production capacity for food, fiber and biofuel as related to soil, biology and climatic resources. Principles and case studies of sustainable systems presented from developing and developed countries. Emerging issues in agricultural globalization and biodiversity.

441 Plant Breeding and Biotechnology
Spring of even years. 3(3-0) Interdepartmental with Forestry and Horticulture. Administered by Crop and Soil Sciences. P: (CSS 350 or concurrently) or (IBIO 341 or concurrently)
Plant improvement by genetic manipulation. History of plant breeding. Traditional and biotechnological means of improving plant cultivars by genetic manipulation. Importance of plant breeding to our food system, economy, and environment.

442 Agricultural Ecology
Fall. 3(3-0) R: Open to juniors or seniors or graduate students.
Ecological principles in the design and management of agricultural ecosystems. Integration of ecological factors regulating crop and rangeland productivity.

445 Evolution (W)
Fall, Spring, Summer. 3(3-0) Interdepartmental with Integrative Biology and Plant Biology. Administered by Integrative Biology. P: (IBIO 341 or CSS 350) and completion of Tier I writing requirement R: Not open to freshmen. SA: ZOL 345, ZOL 445
Processes of evolutionary change in animals, plants. Microbes. Population genetics, microevolution, speciation, adaptive radiation, macroevolution. Origin of Homo sapiens.

451 Biotechnology Applications for Plant Breeding and Genetics
Spring. 3(2-2) Interdepartmental with Forestry and Horticulture. Administered by Crop and Soil Sciences. P: CSS 350 or IBIO 341 R: Open to juniors or seniors or graduate students.
Principles, concepts, and techniques of agricultural plant biotechnology. Recombinant DNA technology, plant molecular biology and transformation in relation to plant improvement.

452 Watershed Concepts
Fall, Spring, Summer. 3(3-0) Interdepartmental with Agricultural Engineering and Forestry and Fisheries and Wildlife. Administered by Agricultural Engineering. RB: Organic chemistry SA: ESA 452, RD 452, CSUS 452
Watershed hydrology and management. The hydrologic cycle, water quality, aquatic ecosystems, and social systems. Laws and institutions for managing water resources.

455 Environmental Pollutants in Soil and Water
Spring. 3(3-0) P: CEM 143 or CEM 251 RB: CSS 210 R: Open to juniors or seniors or graduate students.
Environmental sources, physiochemical and biological processes, management of plant nutrients, heavy metals, organic contaminants, pesticides and pharmaceuticals in soil and water.

461 Seminar in Plant, Animal and Microbial Biotechnology
Spring. 1(1-0) Interdepartmental with Animal Science and Biosystems Engineering and Horticulture. Administered by Horticulture. P: (ANS 425 or concurrently) or (BE 360 or concurrently) or (CSS 451 or concurrently) or (MMG 445 or concurrently)
Current applications of plant, animal and microbial biotechnology in agriculture and related industries. Technologies under development and factors associated with moving from laboratory to product development. Field trips required.

464 Statistics for Biologists
Fall. 3(3-0) Interdepartmental with Animal Science and Statistics and Probability. Administered by Statistics and Probability. P: MTH 103 or MTH 110 or MTH 116 or MTH 132 RB: STT 421
Biological random variables. Estimation of population parameters. Testing hypotheses. Linear correlation and regression. Analyses of counted and measured data to compare several biological groups including contingency tables and analysis of variance.

467 BioEnergy Feedstock Production
Fall. 3(3-0) Interdepartmental with Biosystems Engineering and Forestry. Administered by Crop and Soil Sciences. P: MTH 103 or MTH 116 or MTH 124 or MTH 132 or LB 118 or MTH 152H or MTH 133 or MTH 153H or LB 119 RB: CSS 101 and CSS 210
Agronomic, economic, technological, and environmental principles involved in bioenergy feedstock production. Cultivation, harvest, transportation, and storage of agricultural and forest biomass.

470 Soil Resources
Fall. 3(2-3) P: CSS 210 R: Not open to freshmen or sophomores.
Evaluation of the properties, genesis, and classification of soil resources to assist in making land-use decisions.

477 Pesticides in Pest Management
Fall of even years. 3(3-0) Interdepartmental with Entomology and Horticulture. Administered by Entomology. RB: General chemistry, entomology, plant pathology, weed science. R: Open to juniors or seniors or graduate students.
Chemistry, modes of action, product development and regulation of pesticides. Environmental and social aspects of pesticide use.

480 Soil Fertility and Management
Fall. 3(3-0) P: CSS 210 and (CSS 330 or CSS 340 or CSS 360 or (CSS 470 or concurrently)) R: Open to seniors in the Agronomy minor or in the Crop and Soil Sciences major.
Comprehensive management of agricultural soils. Soil fertility, including liming and fertilizer materials and other nutrient sources. Site specific soil management. Environmental impacts including soil erosion, runoff, and organic matter mineralization.

486 Biotechnology in Agriculture: Applications and Ethical Issues
Fall of even years. 3(3-0) Interdepartmental with Forestry and Horticulture and Philosophy. Administered by Horticulture. P: BS 161 or PLB 105 RB: CSS 350 or ZOL 341 R: Not open to freshmen or sophomores.
Current and future roles of biotechnology in agriculture: scientific basis, applications. Environmental, social, and ethical concerns.

488 Agricultural Cropping Systems: Integration and Problem Solving
Spring. 3(2-2) P: (CSS 101 and CSS 210) and completion of Tier I writing requirement. RB: (PLP 405 and ENT 404) and Course work in crop production and management. R: Open to seniors in the Agronomy minor or in the Crop and Soil Sciences major.
Integration and synthesis of agronomic and related concepts in agricultural cropping systems. Problem solving and application of information.

490 Independent Study
Fall, Spring, Summer. 1 to 4 credits. A student may earn a maximum of 8 credits in all enrollments for this course. P: CSS 101 or CSS 210 R: Approval of department; application required.
Individual work on field, laboratory, or library research problem of special interest to the student.

491 Special Topics
Fall, Spring, Summer. 1 to 4 credits. A student may earn a maximum of 8 credits in all enrollments for this course. P: CSS 101 or CSS 210
Topics from crop production, crop physiology, turfgrass management, organic soils, turfgrass soils, soil fertility, plant and soil relationships, genetics, biotechnology, environmental science, or sustainable agriculture.

492 Professional Development Seminar II
Fall. 1(0-2) P: (CSS 192 or CSS 262) and (CSS 210 and completion of Tier I Writing requirement) R: Open to seniors in the Department of Plant, Soil and Microbial Sciences.
Synthesis, integration and application of agronomic principles to current issues in agronomy via discussion and oral and written communication.

493 Professional Internship in Crop and Soil Sciences
Summer. 3 credits. A student may earn a maximum of 6 credits in all enrollments for this course. A student may earn a maximum of 6 credits in all enrollments for any or all of these courses: ABM 493, ANR 493, ANS 493, CMP 493, CSS 493, CSUS 493, EEP 493, FIM 493, FSC 493, FW 493, HRT 493, PKG 493, and PLP 493. P: Completion of Tier I Writing Requirement R: Approval of department; application required.
Supervised professional experiences in crop and soil sciences.

499 Undergraduate Research
Fall, Spring, Summer. 3(0-9) A student may earn a maximum of 9 credits in all enrollments for this course. R: Approval of department; application required.
Faculty supervised research in a selected area of crop and soil sciences or environmental soil science.

802 Weed Biology
Spring of even years. 2(2-0) RB: A previous course in weed science or plant biology or ecology.
Weed biology, including weed seed production and dispersal and seed fate. Weed life history traits and ecophysiology, including invasive species. Data collection in weed ecology research.

805 Herbicide Action and Metabolism
Spring of odd years. 2(2-0)
Properties and characteristics of herbicides. Processes involved in herbicide action, transport, and fate in plants and soils.

814 Advanced Statistics for Biologists
Spring. 4(3-2) Interdepartmental with Animal Science and Statistics and Probability. Administered by Statistics and Probability. RB: STT 464
Concepts of reducing experimental error for biological and agricultural research. Covariance, randomized block designs, latin squares, split plots, repeated-measures designs, regression applications, and response surface designs. Analyses using statistical software.

819 Advanced Plant Breeding
Fall of even years. 3(3-0) Interdepartmental with Forestry and Horticulture. Administered by Horticulture. RB: STT 422 and ZOL 341
Genetic expectations resulting from breeding strategies with cross- and self-pollinated crop plants. Germplasm collections, mapping populations, and modifications of reproductive biology useful for crop improvement.

820 Plant Reproductive Biology and Polyploidy
Spring of odd years. 1(3-0) Interdepartmental with Forestry and Horticulture and Plant Biology and Plant Pathology. Administered by Horticulture. RB: Introductory Genetics and Plant Biology
Genetic processes underlying variations in plant reproductive biology and polyploidy. Utilization of these characteristics in plant breeding.

840 Soil Physics
Fall of odd years. 3(2-3) R: Open to graduate students in the College of Agriculture and Natural Resources or in the College of Engineering or in the College of Natural Science.
Physical properties of soil including texture, structure, consistency, aeration, moisture content, and temperature. Quantitative measurement of plant growth. Agronomic and engineering practices.

843 Forum in Computational and Plant Sciences
Fall, Spring. 1(1-0) A student may earn a maximum of 4 credits in all enrollments for this course. Interdepartmental with Biochemistry and Molecular Biology and Computational Mathematics, Science, & Engineering and Horticulture and Plant Biology. Administered by Plant Biology.
Professional development focused on diverse modes of communication in support of interdisciplinary science with an emphasis on plant and computational sciences.

846 Integrated Climate and Cropping System Modeling
Spring of odd years. 3(3-0) Interdepartmental with Biosystems Engineering. Administered by Crop and Soil Sciences. RB: GEO 402
Crop simulation modeling for water and nutrient use under resource limitations and varying climatic conditions.

850 Soil Chemistry
Spring. 3(3-3) R: Open to graduate students in the College of Agriculture and Natural Resources or in the College of Engineering or in the College of Natural Science.
Ion activities, ionic exchange and equilibrium reactions. Soil pH, macro- and micronutrients, saline soils and availability of nutrients to plants.

853 Plant Mineral Nutrition
Fall of odd years. 3(3-0) Interdepartmental with Horticulture. Administered by Horticulture. RB: PLB 301
Inorganic ion transport in plant cells and tissues. Physiological responses and adaptation to problem soils. Genetic diversity in nutrient uptake and use by plants. Physiological roles of elemental nutrients in crop growth.

863 Mineral-Water Interactions
Fall of even years. 4(3-2) Interdepartmental with Geological Sciences. Administered by Geological Sciences. R: Open only to graduate students in the Department of Crop and Soil Sciences or Department of Geological Sciences or Department of Geography.
Mineralogy, petrology and geochemistry of fluid-rock reactions in geologic, sedimentary and geochemical cycles. Rock and mineral weathering, soil formation, genesis and burial diagenesis of sediments and sedimentary rocks, and metamorphism.

865 Environmental Fate of Organic Contaminants in Soils
Spring of even years. 3(3-0) RB: Undergraduate level coursework in general and organic chemistry, and introductory microbiology
Chemistry and biology of toxicants in soils as determinants of environmental fate.

880 Scientific Communication and Professional Development
Spring. 1(0-2)
Interactive professional experiences including grant preproposal preparation and presentation, scientific presentations, mock position interviews, and resume preparation.

890 Independent Study
Fall, Spring, Summer. 1 to 6 credits. A student may earn a maximum of 8 credits in all enrollments for this course. R: Open to graduate students in the College of Agriculture and Natural Resources or in the College of Engineering or in the College of Natural Science.
Individual study on field, laboratory, or library research.

891 Current Topics in Ecology and Evolution
Summer. 1 to 2 credits. A student may earn a maximum of 10 credits in all enrollments for this course. Interdepartmental with Integrative Biology and Plant Biology. Administered by Integrative Biology. SA: ZOL 891
Presentation and critical evaluation of theoretical and empirical developments in ecology and evolutionary biology by visiting scientists.

891B Selected Topics in Plant Breeding and Genetics
Fall, Spring, Summer. 1 to 2 credits. A student may earn a maximum of 6 credits in all enrollments for this course. Interdepartmental with Forestry and Horticulture. Administered by Horticulture. R: Open only to graduate students in the Plant Breeding and Genetics major or Genetics major. Approval of department.
Selected topics in plant breeding.

892 Plant Breeding and Genetics Seminar
Fall, Spring, Summer. 1(1-0) A student may earn a maximum of 8 credits in all enrollments for this course. Interdepartmental with Forestry and Horticulture. Administered by Horticulture.
Experience in review, organization, oral presentation, and analysis of research.

892B Ecological Food and Farming Systems Seminar
Fall, Spring. 1 credit. Interdepartmental with Community, Ag, Recreation & Res Studies. Administered by Crop and Soil Sciences.
Experiential learning, and multidisciplinary and applied research, in ecological food and farming systems.

893 Selected Topics
Fall, Spring, Summer. 1 to 3 credits. A student may earn a maximum of 6 credits in all enrollments for this course. R: Open to graduate students in the College of Agriculture and Natural Resources or in the College of Engineering or in the College of Natural Science.
Selected topics in crop and soil sciences of current interest and importance.

899 Master's Thesis Research
Fall, Spring, Summer. 1 to 12 credits. A student may earn a maximum of 99 credits in all enrollments for this course. R: Open to master's students in the Department of Plant, Soil and Microbial Sciences.
Master's thesis research.

941 Quantitative Genetics in Plant Breeding
Spring of even years. 3(2-2) Interdepartmental with Forestry and Horticulture. Administered by Crop and Soil Sciences. RB: CSS 819 and STT 464
Theoretical and genetic basis of statistical analysis of quantitative traits using genetic markers. Computational tools for the study of quantitative traits.

999 Doctoral Dissertation Research
Fall, Spring, Summer. 1 to 24 credits. A student may earn a maximum of 36 credits in all enrollments for this course. R: Open to doctoral students in the Department of Plant, Soil and Microbial Sciences.
Doctoral dissertation research.