

Agricultural and Biological Engineering

Courses Intended Primarily for Students in Agricultural and Biological Engineering and Biological and Food Process Engineering

Undergraduate Level/Lower-Division Courses

ABE 12000 Introduction to Agricultural and Biological Engineering Sem. 1 and 2. Lab. 2, cr. 1.

Introduction to engineering technologies and career opportunities involved in agricultural and biological engineering. A selection of invited lectures, participation exercises, lab tours, and field trips designed to acquaint students with the profession of agricultural and biological engineering. Topics to be covered may include biopolymers, alternate fuels, emulsions in food, extruded food products, finite element analysis, geographic information systems, site-specific resource usage, mechanical properties of biological materials, post-harvest engineering, and control systems in food process engineering.

ABE 20100 Thermodynamics in Biological Systems I Sem. 1. Class 3, cr. 3. Prerequisite: CHM 11600 or CHM 12400.

Thermodynamic principles associated with biological systems and processing of biological materials. Emphasis on the first law of thermodynamics. Fundamentals of steady-state mass and energy balances for reacting and non-reacting processes including multiple unit operations emphasizing living systems and bio-processing. Applications of the first law conservation of energy to biological systems, energy conversion systems, and the environmental impacts of energy production. Development of engineering problem solving skills via MathCad and MatLab software.

ABE 20200 Thermodynamics in Biological Systems II Sem. 2. Class 3, cr. 3. Prerequisite: ABE 20100 and MA 26100.

Thermodynamic principles and their applications to biochemical and biological systems with emphasis on the second law of thermodynamics and use of molecular interpretations of energies and entropies. Concept of entropy balances and process efficiency. Free energy and chemical equilibrium. Equilibrium between phases, colligative properties, binding of ligands and formation of biological membranes. Molecular motion and transport properties and their application in biochemical analytical methods. Development of physical chemical problem solving skills using MathCad and Matlab software.

ABE 20500 Computations for Engineering Systems Sem. 1. Class 2, lab. 2, cr. 3. Prerequisite: ENGR 12600. Prerequisite or corequisite: PHYS 17200.

Development of engineering problem-solving and design skills. Use of Excel, Matlab, and MathCad for problem solving, data analysis, numerical modeling, and statistics. Introduction to elementary statics, dynamics, materials, thermodynamics, fluid mechanics, and energy topics.

ABE 21000 Biological Applications of Material and Energy Balances Sem. 2. Class 3, cr. 3. Prerequisite: CHM 11600 and PHYS 17200.

Applications of material and energy balances to biological and engineering systems; development of a framework for the analysis of biological systems from an engineering perspective. Introduction to applications of the first and second laws of thermodynamics to biological and mechanical engineering systems. Topics include refrigeration systems, power cycles, energy conversion systems, and environmental impacts of energy production.

ABE 28100 Professional Internship Sem. 1 and 2. SS. Cr. 0.

Supervised professional experience in agricultural and biological engineering. Program conducted under the direction of an engineering faculty member and with the cooperation of an employer. Student submits a summary report.

ABE 29000 Sophomore Seminar Sem. 1. Lec. 1, prsn. 1, cr. 1.

Current agricultural and biological engineering issues will be discussed by students, staff, and guest speakers. Career planning, employment opportunities, professionalism, ethics, and improvement of communication skills will be emphasized.

ABE 29199 Professional Practice 5-Session Co-Op I Sem. 1, 2, and SS. Experiential. Cr. 0.

Professional practice with qualified employers within industry, government, or small business.

ABE 29299 Professional Practice 5-Session Co-Op II Sem. 1, 2, and SS. Experiential, Cr. 0.

Professional practice with qualified employers within industry, government, or small business.

Undergraduate Level/Upper-Division Courses

ABE 30100 Modeling and Computational Tools in Biological Engineering Sem. 2. Class 3, cr. 3. Prerequisites: (ABE 20200 and MA 26200) or (ABE 20200 and MA 26500 and MA 26600) or (MA 26600 and M E 20000).

Introduction to principles of analysis, setup, and modeling of biological systems using fundamental principles of engineering. Development of algebraic and differential models of steady state and transient processes involving material and energy balances, elementary thermodynamic, transport, and kinetic reaction principles, and economics in biological engineering systems.

ABE 30300 Applications of Physical Chemistry to Biological Processes Sem. 1. Class 3, cr. 3. Prerequisite: ABE 21000 and CHM 25700. Prerequisite or corequisite: CHE 37700.

Physical chemical principles associated with transport of mass, momentum and energy in bioprocesses. Principles for measuring physical chemical properties, a description of predictive equations for their evaluation and the role of these principles in the design and optimization of bioprocesses.

ABE 30500 Physical Properties of Biological Materials Sem. 1. Class 2, lab. 2, cr. 3. Prerequisite or corequisite: ABE 20500.

Physical properties of agricultural crops and food products and their relationship to harvesting, storage, and processing. Physical properties covered include: density, shape, moisture content, water potential, water activity, friction and flow of particulate solids, terminal velocity, thermal properties, interaction with electromagnetic radiation, and viscoelastic behavior of solids.

ABE 31000 Thermodynamics of Food and Biological Systems Sem. 1. Class 3, cr. 3. Prerequisite: ABE 21000.

Basic concepts of thermodynamic energy and entropy functions applied to food and biological systems. Equations of state, phase rule, non-ideality, fugacity, activity models, vapor-liquid equilibria, colligative properties, osmotic pressure, ionic solutions, active transport, ATP cycle, characterization of macromolecules, chemical reaction equilibria.

ABE 32000 Solid Modeling, Simulation, and Analysis Sem. 2. Class 1, lab. 4, cr. 3. Prerequisite: NUCL 27300 and MA 26200. Prerequisite or corequisite: M E 27400.

Introduction to parametric, feature-based solid modeling; dimensioned 2D and 3D engineering drawings; tolerancing; mechanical dynamic simulation; kinematic models, analysis and simulation of simple linkages and complex systems; mechanism design and evaluation; visualization and animation of results; interfacing of computer aided engineering software. Projects involving industrial parts and assemblies will be discussed and assigned.

ABE 32500 Soil and Water Resource Engineering Sem. 1. Class 3, lab. 3, cr. 4. Prerequisite or Corequisite: AGRY 25500, and (M E 30900 or [C E 34000 and 34300]).

Interrelationships of the plant-water-air-soil system; hydrologic processes; protection of surface and ground water quality; GIS targeting of soil and water protection measures; and design of subsurface and overland drainage systems, irrigation systems, and soil erosion control practices.

ABE 33000 Design of Machine Components Sem. 2. Class 2, lab. 2, cr. 3. Prerequisite: NUCL 27300. Prerequisite or corequisite: ABE 20500.

Introduction to design; stress analysis; deformation and stiffness considerations; static and fatigue strength design; design of components of the food processing, farm and off-highway machines, and mechanical systems.

ABE 33600 All Terrain Vehicle Design Sem. 2. SS. Class 2, lab 2, cr. 3. Prerequisite: ABE 20500.

A structured approach o the design process, including innovation analysis, evaluation, documentation, and presentation. Design areas typically focus on machinery and vehicles related to agricultural applications. During the first two weeks, the students will define their design problem, statement of work, approach, and timeline. Their final report will summarize the design process and steps used to solve the proposed problem. All students will give a brief presentation of their design during the last weekly lab meeting.

ABE 37000 Biological/Microbial Kinetics and Reaction Engineering Sem. 2. Class 3, cr. 3. Prerequisite: ABE 30100and CHM 25700 and (MA 26200 or [MA 26500 and 26600]). Prerequisite or corequisite: BIOL 22100.

Study of the rates of chemical/biochemical reaction and catalysis in agricultural, food, and biological systems with applications to engineering process design. Applications include microbial growth, enzyme catalysis, fermentation and reactor design. Introductory enzymatic and microbial reaction concepts will be taught and incorporated into reactor design.

ABE 29199 Professional Practice 5-Session Co-Op I Sem. 1, 2, and SS. Experiential. Cr. 0.

Professional practice with qualified employers within industry, government, or small business.

ABE 29299 Professional Practice 5-Session Co-Op II Sem. 1, 2, and SS. Experiential. Cr. 0.

Professional practice with qualified employers within industry, government, or small business.

ABE 38199 Professional Practice 3-Session Co-Op I Sem. 1, 2, and SS. Experiential. Cr. 0.

Professional practice with qualified employers within industry, government, or small business.

ABE 38299 Professional Practice 3-Session Co-Op II Sem. 1, 2, and SS. Experiential. Cr. 0.

Professional practice with qualified employers within industry, government, or small business.

ABE 38399 Professional Practice 3-Session Co-Op III Sem. 1, 2, and SS. Experiential. Cr. 0.

Professional practice with qualified employers within industry, government, or small business.

ABE 39399 Professional Practice 5-Seesion Co-Op III Sem. 1, 2, and SS. Experiential. Cr. 0.

Professional practice with qualified employers within industry, government, or small business.

ABE 39499 Professional Practice 5-Session Co-Op IV Sem. 1, 2, and SS. Experiential. Cr. 0.

Professional practice with qualified employers within industry, government, or small business.

ABE 39599 Professional Practice 5-Session Co-Op V Sem. 1, 2, and SS. Experiential. Cr. 0.

Professional practice with qualified employers within industry, government, or small business.

ABE 39699 Professional Practice Internship Sem. 1, 2, and SS. Experiential. Cr. 0.

Professional practice with qualified employers within industry, government, or small business.

ABE 43000 Instrumentation and Data Acquisition Sem. 1. Class 2, lab. 2, cr. 3. Prerequisite: ABE 20100 or ABE 20500.

Industrial applications of transducers for measuring pressure, flow, temperature and other quantities in food processing, agricultural, and biological engineering. Topics include characteristics of instruments; operational amplifier circuits; interfacing instruments with computers; data acquisition hardware and software. Exercises include hands-on experiments with electronic components and transducers such as thermocouples, turbine flow meters, global positioning systems (GPS), and computer programming for data acquisition.

ABE 43500 Hydraulic Control Systems for Mobile Equipment Sem. 1. Class 2, lab. 2, cr. 3. Prerequisite: C E 34000 and 34300, or M E 30900.

Design of basic fluid power components and systems. Includes power steering, hydrostatic and hydromechanical transmission, electrohydraulic servovalves, servomechanism, and manually controlled systems.

ABE 45000 Finite Element Method in Design and Optimization Sem. 1. Class 3, cr. 3. Prerequisite: MA 26600 and BME 20400 or NUCL 27300.

Fundamentals of the finite element method as it is used in modeling, analysis, and design of thermal/fluid and mechanical systems; one- and two-dimensional elements; boundary value problems; heat transfer and fluid flow problems; structural and solid mechanics problems involving beam, truss, frame, plate, and shell elements; computer-aided design and optimization of machine components, structural elements, and thermal/fluid system.

ABE 45400 Transport Processes in Biological and Food Process Systems Sem. 2. Class 3, lab. 3, cr. 4. Prerequisite or corequisite: CHE 37800.

Application of momentum and heat transfer to biological and food process engineering. Viscosity, non-Newtonian fluids, experimental methods of rheological characterization of food and biological systems; viscoelasticity; design equations for pipeflow, pumps, mixing, emulsification, extrusion, sheeting, heat exchangers, aseptic processing, sterilization, freezing, and evaporation.

ABE 46000 Sensors and Process Control Sem. 2. Class 2, lab. 2, cr. 3. Prerequisite: MA 26200 or MA 26600.

Fundamental aspects of transducers, biosensors, instrumentation, and computer control are presented, with particular emphasis on sensors and controls used in agricultural, biological, and food applications. Laboratory and pilot plant scale computer controlled equipment is used to examine response of process variables, sensor calibration, control system modeling, and controller selection and tuning.

ABE 48500 Agricultural and Biological Engineering Design Sem. 2. Class 1, lab. 6, cr. 4. Prerequisite: ABE 32500 and 33000.

Machine or environmental system design projects, team or individual, related to contemporary or potential problems in agricultural and biological engineering.

ABE 49000 Professional Practice in Agricultural and Biological Engineering Sem. 1. Lec. 1, prsn. 1, cr. 1. Prerequisite: ABE 29000.

Career areas in agricultural engineering; job opportunities and graduate study; professional attitudes and ethics; contracts and specifications; patents.

ABE 49500 Select Topics in Agricultural and Biological Engineering Sem. 1 and 2. SS. Cr. 1-3.

Credit and hours to be arranged. Special topics and projects of contemporary importance or of special interest that are outside the scope of the standard agricultural and biological engineering curriculum. The specific topic that is offered will be indicated on the student's record. A written report and oral presentations of final results are required.

ABE 49800 Undergraduate Research in Agricultural and Biological Engineering Sem. 1 and 2. SS.

Credit and hours to be arranged. Individual research projects for students with the approval of their advisors. Requires prior approval of, and arrangement with, a faculty research advisor. A written report and public oral presentation of final results are required.

ABE 49900 Thesis Research Sem. 1 and 2. SS. Cr. 1-6.

Individualized research on agricultural and biological engineering problems. Arrange with honors program coordinator before registering. Arrange with program coordinator before registering. A written report and public oral presentation of final results are required.

Dual Level/Undergraduate-Graduate

ABE 50100 Welding Engineering Sem. 2. Class 3, cr. 3. Prerequisite: ABE 45000.

Design of weldments and modeling heat transfer and residual stresses of the welding processes. Finite element theory of non-linear properties for the many processes including laser, submerged arc, manual, GTAW, plasma, and electron beam. Metallurgy will include continuous cooling transformation curves in optimizing engineered joint strength including cutting and welding.

ABE 52200 Ecohydrology Sem. 1. Class 3, Cr. 3.

Ecohydrology links hydrological and ecological processes at various spatiotemporal scales and is considered to be one of the most exciting frontiers of future. Hydrological processes in individual ecosystems and the role of water in linking the myriad components of the landscape will be explored in this three-credit hour course. Interactions between hydrological and biological processes and factors that regulate and shape these interactions will be covered. The ecohydrology principles covered will include integration of water and biota at a catchment scale, nutrient transport and cycling, modeling ecohydrologic processes, and quantification of ecosystem services. Recommended: a prior course in hydrology.

ABE 52500 Irrigation Management and Design Sem. 2. Class 3, cr. 3. Prerequisite: ABE 32500.

Irrigation management and design, including water resources planning, soil moisture movement and utilization, irrigation scheduling, system selection and operation, pumping plant characteristics and efficiency, hydraulic network analysis, system evaluation and environmental efficiency.

ABE 52600 Watershed Systems Design Sem. 2. Class 3, cr. 3. Prerequisite: ABE 32500.

Hydrologic design of upland water management systems for erosion control, water utilization, and run-off control; spatial analysis using Geographic Information Systems (GIS); examination of economic factors; analysis and design of composite systems for agricultural watersheds.

ABE 52700 Computer Models in Environmental and Natural Resources Engineering Sem. 2. Class 2, lab. 2, cr. 3. Prerequisite: ABE 32500, C E 34000 and 34300. Offered in even-numbered years.

This course offers students in environmental and natural resources engineering programs an understanding of the hydrological processes and related design skills. Principles of soil erosion by water; drainage of agricultural lands; surface runoff; flood and reservoir routing; hydrodynamic and water quality in pipe network; and non-point source pollution and transport phenomenon are studied. Current computer models utilized in industry for decision support are applied using case studies to further enhance the understanding of the hydrological processes. Limitations and advantages of the models will be discussed.

ABE 52900 Nonpoint Source Pollution Engineering Sem. 2. Class 3, cr. 3. Prerequisite: ABE 32500 or AGRY 33700 or CE 54200 or graduate status.

Engineering principles involved in assessment and management of nonpoint source (NPS) pollution. Effect of NPS pollution on ecosystem integrity. Use of GIS/mathematical models to quantify extent of pollution. Design/implantation of best management practices to reduce nonpoint source pollution and improve water quality. Discussion of Total Maximum Daily Load (TMDL) principles and processes.

ABE 53100 Instrumentation and Data Acquisition Sem. 1. Class 2, lab. 2, cr. 3. Prerequisites: ABE 20100 or 20500; MA 26200 or 26600.

This course educates students in the use, selection, and design of instrumentation and data acquisition systems for agricultural, food, environmental and biological systems. Emphasis will be on measurement of position (GPS), force, pressure, power, torque, flow, and temperature along with environmental sensors. Labs will focus on building and using measurement systems, and programming PC computers for data acquisition and analysis. Prior knowledge of electrical circuitry is desirable.

ABE 54500 Design of Off-Highway Vehicles Sem. 1. Class 2, lab. 2, cr. 3. Prerequisite: ABE 33000 or graduate student status.

Problems associated with the design of off-highway vehicles, with special emphasis on farm and industrial tractors and self-propelled machines; engines; power traction; vehicle control systems; human factors; testing and evaluation of performance.

ABE 55500 Biological and Food Processing Unit Operations Sem. 1. Class 3, lab. 3, cr. 4. Prerequisite: CHE 37800.

Analysis and design of operations such as sterilization, freezing, dehydration, fermentation, and separation processes. Integration of pilot plant results into the design and scale up of process systems. Emphasis on how the properties of biological materials influence the quality of the processed product.

ABE 55600 Biological and Food Process Design Sem. 2. Class 3, lab. 3, cr. 4. Prerequisite: ABE 55500.

This course will focus on the synthesis, creation, evaluation, and optimization of a preliminary process design to convert basic biological materials into a finished product. Concepts of material and energy balances, thermodynamics, kinetics, transport phenomena of biological systems will be used to design processes to minimize energy and environmental impacts, and evaluate economic factors while maintaining product quality. Group projects, written and oral reports.

ABE 56000 Biosensors: Fundamentals and Applications Sem. 2. Class 3, cr. 3. Prerequisites: CHM 11600 and MA 26600.

An introduction to the field of biosensors and an in-depth and quantitative view of device design and performance analysis. An overview of the current state of the art to enable continuation into advanced biosensor work and design. Topics emphasize biomedical, bio-processing, environmental, food safety, and biosecurity applications.

ABE 56500 Agricultural Systems Engineering Sem. 1. Class 3, cr. 3.

Analysis and optimization of systems for agricultural production and processes; simulation by mathematical models of discrete and continuous biological and biochemical systems; single-server queuing, linear programming, and search techniques for agricultural processes.

ABE 58000 Process Engineering of Renewable Resources Sem. 2. Class 3, cr. 3. Prerequisite: Introductory biochemistry and biology or CHE 59700. Senior status, including knowledge of solution of ordinary differential equations.

Analyze and mathematically simulate processes for manufacture of biotechnology products based upon nonrecombinant and recombinant organisms. Relate properties of biomolecules derived from fermentation, cell culture, or enzyme reactions to unit operations used in their manufacture and purification. Survey new developments in tissue engineered materials, nanotechnology, bioinformatics, and metabolic engineering.

ABE 59000 Special Problems Sem. 1 and 2. SS. Cr. 1–6.

Assignment by consent of the instructor in the field of selected study. Laboratory, field, and library studies and reports on special problems related to agricultural and biological engineering not covered in regular coursework.

ABE 59100 Special Topics Sem. 1 and 2. SS. Cr. 0–4.

Primarily designed for students (two or more) desiring credit from subject areas for which no specific course, workshop, or individual study plan is offered. Area of study will deal with topics that have enough student interest to justify the formalized teaching of a specialized topic. The course may be repeated by a student as long as the topic being taught is not repeated.

ABE 59200 Special Topics II Sem. 1 and 2. SS. Arrange hours. Cr. 1-4. Prerequisite: Consent of instructor required. May be repeated for credit.

Special topics in agricultural and biological engineering for which no specific course is offered. Course may be repeated for credit as long as topic is not repeated.

Agricultural Systems Management

Courses Intended Primarily for Students in Agriculture and Agricultural Systems Management

Undergraduate Level/Lower-Division Courses

ASM 10400 Introduction to Agricultural Systems Sem. 1 and 2. Class 2, lab. 2, cr. 3.

Basic principles of selection and operation of agricultural production equipment, including farm tractors and machines and crop-processing equipment. Planning considerations for crop storage and animal production systems and devices for water conservation and erosion control.

ASM 10500 Agricultural Systems Computations and Communication Sem. 2. Class 2, lab 2, cr. 3. Prerequisite or corequisite: ASM 104

Use of computers to solve problems related to agricultural technology and businesses. Spreadsheets, word processors, and presentation software will be the focus. Emphasis will be on logical problem solving and data presentation using advanced features of office software. A 100-level number is being used because it is intended as a first-year course.

ASM 11400 Introductory Welding Sem. 1 and 2. SS. Class 1, lab. 4, cr. 3.

Designed to provide basic skills and fundamental knowledge in oxy-acetylene, shielded metal welding and gas metal arc welding. Covers industry welding practices and includes a detailed study of techniques used in making all weld positions. Emphasizes safe practices in welding, cutting, and shielded metal arc welding processes. Enrollment is limited to students in Agricultural Education. However, Agricultural Systems Management students or students from other majors may take the course with permission from the course coordinator.

ASM 20100 Construction and Maintenance Sem. 1 and 2. Class 2, lab. 3, cr. 3.

Fundamental principles in the selection and use of tools for the construction and maintenance of agricultural and related facilities, equipment, and machines. Areas covered include small engines, concrete and masonry, wood, plumbing, electricity, and metal.

ASM 21100 Technical Graphic Communications Sem. 1 and 2. Class 2, lab. 2, cr. 3. Prerequisite or corequisite: ASM 23100.

Introduction to graphic communication methods using traditional techniques and emphasizing modern computer-based techniques. Topics covered include: free-hand sketching, lettering, and dimensioning; selection of data presentation methods; and plan interpretation and cost calculations. A majority of assignments will include use of commercially available computer-aided drawing packages.

ASM 21500 Surveying Sem. 1 and 2. Class 2, lab. 3, cr. 3.

Introduction to plane surveying. Instruction and practice in the use of surveying instruments for distance measurement, leveling, angle measurement, direction determination, traversing, and mapping. Office procedures for surveying data reduction. Practical problems and field exercises of the type encountered by the landscape architect and forester.

ASM 22100 Career Opportunities Seminar Sem. 1. Class 1, cr. 1. Prerequisite or corequisite: ASM 10400

An introductory course to acquaint students with career and employment opportunities in the field of agricultural systems management. Guest speakers are invited to share their experiences and philosophies with the students. Special emphasis is given to improving communication skills.

ASM 22200 Crop Production Equipment Sem. 1. Class 2, lab. 2, cr. 3. Prerequisite: ASM 23100 or (ASM 10400 and AGECE 20200).

Principles of machine performance, capacity, machinery components, and operation. Study of tractors, trucks, utility vehicles, and combines. Equipment topics include chemical application, tillage tools, planters and seeders, hay and forage harvesters, electronic monitors and controllers. Computer-based analysis of equipment sizing and systems selection.

ASM 24500 Materials Handling and Processing Sem. 2. Class 2, lab. 2, cr. 3. Prerequisite or corequisite: ASM 23100 (ASM 10400 and AGECE 20200)

Principles of materials handling and processing. Physical properties and characteristics of food, fiber, and feed materials as related to harvesting, handling, processing, and storage. Processing of agricultural materials including drying, preservation, size reduction (e.g. grinding, crushing, shredding), mixing and blending, refrigeration, extrusion, and pelleting. Conveying and transport systems with consideration of their effects on damage and quality. The course elements are tied together by a treatment of scheduling and coordination of biologically based systems, which involve production, handling, quality control, and processing.

Undergraduate Level/Upper-Division Courses

ASM 31100 Advanced Technical Graphics Communications Sem. 1. Class 2, lab. 2, cr. 3 (el. 5 or 7 A). Prerequisite: ASM 21100.

Symbol library creation and manipulation, computer-aided drawing (CAD) data-base extraction for report generation, introduction to Lisp programming and drawing automation, three-dimensional wire frame modeling, surface rendering, and introduction to solid modeling. Assignments will include use of commercially available CAD packages.

ASM 32200 Technology for Precision Agriculture Sem. 1. Class 2, lab. 2, cr. 3. Prerequisite: ASM 22200.

Technology and applications of electronics for precision agriculture. Characteristics of personal computer hardware, electronic sensors, monitors, machine controllers, environmental monitors, and global positioning systems. Production management information systems; processing and marketing information systems; and yield mapping, geographic information system data handling, and software options.

ASM 33300 Facilities Planning and Management Sem. 2. Class 2, lab. 2, cr. 3. Prerequisite: ASM 23100 or (ASM 10400 and AGECE 20200).

Principles of facility (system) planning and management involving buildings, equipment, and materials handling and flow. Student teams select a case firm (problem) with instructor approval. Principles learned week by week are applied to the development of an overall plan for the complex, over the course of the semester. Case examples can include firms handling supplies, seeds, grains, feeds, chemicals, wastes, and farm produce, as well as farming operations producing grain, forage, and/or livestock products. Students will learn to use AutoCAD to develop drawings, without prior computer drafting experience.

ASM 33600 Environmental Systems Management Sem. 1. Class 3, cr. 3. Prerequisite: ASM 23100 or (ASM 10400 and AGECE 20200).

Analysis of environmental systems with special emphasis on non-urban and agribusiness needs. Technological and sociological solutions to environmental problems. Computer-based tools are used to analyze global environmental issues, chemical use and management, waste disposal and management, water and air quality, soil and water conservation, sustainable agriculture, regulatory and policy issues.

ASM 34500 Power Units and Power Trains Sem. 1. Class 2, lab. 2, cr. 3. Prerequisite: ASM 23100 or (ASM 10400 and AGECE 20200) and (PHYS 21400 or PHYS 22000).

An introduction to power generation and transfer in mechanical and fluid power systems. Internal combustion engines, fuels, and cycles are introduced. Clutches, mechanical transmissions, automatic transmissions, hydrostatic transmissions, and final drives are discussed. Principles of hydraulics, fluids, cylinders, pumps, motors, valves, hoses, filters, reservoirs, and accumulators are studied.

ASM 35000 Safety in Agriculture Sem. 2. Class 1, lab. 1, cr. 1.

An overview of the agricultural safety movement in the United States with consideration given to the specific human environmental and technological factors influencing farm-related accidents. Special emphasis is given to reduction of unnecessary risks in agricultural production. Course meets during weeks 1–8.

ASM 39000 Agricultural Systems Management Co-op Sem. 1 and 2. SS. Cr. 0.

Supervised professional experiences in agricultural systems management. Programs must be preplanned and conducted under the direction of the departmental coordinator with the cooperation of an employer. Students must submit a summary report. Consent of the departmental cooperative professional program coordinator required.

ASM 40000 Agricultural Systems Management Study Abroad Sem. 1 and 2. SS. Credit 0–8. May be repeated for credit.

Utilized to record credits earned through participation in Purdue study abroad programs with cooperating foreign universities.

ASM 42000 Electric Power and Controls Sem. 1. Class 2, lab. 2, cr. 3. Prerequisite: PHYS 21400 or PHYS 22000.

Fundamentals and application of electric power for agricultural facilities; safe wiring principles; operation and performance characteristics of electric motors; applications of control systems that include monitors, sensors, relays, and programmable logic controllers.

ASM 42100 Senior Seminar Sem. 1. Lec. 1, prsn. 1, cr. 1. Prerequisite: ASM 22100.

Professional attitudes and ethics, technical report data presentation, interview procedures and résumé preparation, and producer-consumer relationships.

ASM 44100 Methods of Teaching Agricultural Mechanics Sem. 2. Class 1, cr. 1.

Emphasis on facilities, shop layout, organization, course planning, and demonstrations. Professor Strickland. Course meets during weeks 1–6. For students seeking certification as teachers of agriculture.

ASM 49000 Special Problems Sem. 1 and 2. SS. Cr. 1–6.

Assignment by consent of instructor in the field of selected study. Laboratory, field, and library studies and reports on special problems related to agricultural systems management not covered in regular coursework. A written report and oral presentation of final results is required.

ASM 49100 Special Topics Sem. 1 and 2. SS. Cr. 1–4.

Designed for specialized topic areas for which there is no specific course, but have enough student interest to justify formalized teaching of an undergraduate-level course. The course may be repeated by a student as long as the topic being taught is not repeated. The specific topic that is offered will be indicated on the student's record.

ASM 49500 Agricultural Systems Management Sem. 2. Class 1, lab. 4, cr. 3. Prerequisite: ASM 42100.

Planning, organization, and analysis of individual or team projects related to contemporary issues in agricultural systems management.

ASM 49800 Directed Experience in Teaching Mechanized Agriculture Sem. 1 and 2. SS. Cr. 1–3. Designator required.

This course is designed primarily for students majoring in agricultural education, extension education, agricultural systems management, and agricultural engineering.

ASM 49900 Thesis Research Sem. 1 and 2. SS. Cr. 1–6. Prerequisite: admission to honors program. May be repeated for a maximum of six credits.

Designed for honors projects of scholarly activity associated with research, teaching, extension, or another area acceptable to the departmental honors committee. Arrange with academic advisor and honors program coordinator before registering.

Dual Level/Undergraduate-Graduate

ASM 51000 Agrosecurity – Emergency Management for Agricultural Production Operations Sem. 1. Class 2, arrange 1, cr. 3.

Prepares individuals for management and loss control positions in agricultural production, agribusiness operations and emergency management agencies. Addresses prevention, preparation, mitigation, response, and recovery from disasters such as fires, explosions, entrapments, tornadoes, floods, winter storms, earthquakes, vandalism, chemical releases, and bioterrorism. Students complete a community service learning activity in which they assist a farm or agribusiness manager in developing formal emergency preparedness plans.

ASM 53000 Power and Machinery Management Sem. 1. Class 3, cr. 3. Prerequisite: ASM 22200 and 23100.

Management and selection of farm machines and power units, with emphasis on cost analysis and evaluation of new machines and practices.

ASM 54000 Geographic Information System Applications Sem. 1. Class 2, lab 2, cr. 3. Prerequisite(s): ASM 23100 or equivalent, or consent of instructor.

Fundamentals of GIS analysis applied to environmental, agricultural, and engineering-related problems. Topics include data sources, spatial analysis; projections; creating data and metadata, and conceptualizing and solving spatial problems using GIS.

ASM 54500 (AGRY 54500) Remote Sensing of Land Resources Sem. 1. Class 2, lab 2, cr. 3. Prerequisite: ASM 23100 and AGRY 25500 or 27000, or consent of instructor.

Application of remote sensing and spatial databases for observing and managing land resources within the Earth system; analysis and interpretation of remotely sensed data in combination with field observations and other data sources; conceptualization and design of a global earth resources information system.

ASM 55000 Grain Drying and Storage Sem. 2. Class 3, cr. 3. Prerequisite: ASM 24500.

Crop drying and storage principles, including equilibrium moisture, psychometrics, and drying rates. Modern drying and conditioning techniques including dryeration, in-bin counterflow drying, and combination drying. Estimating fixed and variable drying costs, aeration of stored grain, and maintenance of grain quality.

ASM 59000 Special Problems Sem. 1 and 2. SS. Cr. 1–6.

Assignment by consent of the instructor in the field of selected study. Laboratory, field, and library studies and reports on special problems related to agricultural systems management not covered in regular coursework.

ASM 59100 Special Topics Sem. 1 and 2. SS. Cr. 1–4.

Primarily designed for specialized topic areas for which there is no specific course, workshop, or individual study plan, but which have enough student interest to justify the formalized teaching of a course. The course may be repeated by a student as long as the topic being taught is not repeated.

Agricultural Economics

Undergraduate Level/Lower-Division Courses

AGEC 18100 Orientation to Agricultural Economics Sem. 1. Class 1, cr. 1.

An introduction to and a survey of the field of agricultural economics. Focus will be on the individual development of the student, including opportunities at Purdue, diversity, and career alternatives and planning.

AGEC 20200 Spreadsheet Use in Agricultural Business Sem. 1 and 2. Lab. 2, cr. 1.

Use of computer spreadsheets in business and financial analysis. Students gain capability to use financial, statistical, and logical spreadsheet functions and a wide variety of other spreadsheet capabilities. Accounting, finance, and management principles are put into practice in a spreadsheet environment.

AGEC 20300 Introductory Microeconomics for Food and Agribusiness Sem. 1 and 2. Class 3, cr. 3.

This course introduces the application of microeconomics as used by farms and agribusiness firms. The behavior of individual firms is evaluated as price and output are determined in various market structures (pure competition, pure monopoly, monopolistic competition, and oligopoly). Other topics include pricing and employment of resources, market failure and the social control of industry (government, economic policy, and regulation), cost and production theory.

AGEC 20400 Introduction to Resource Economics and Environmental Policy Sem. 2. Class 3, cr. 3.

The course provides an overview of microeconomic theory and its application to issues related to evaluating resource economic issues and environmental policy. Topics discussed include efficiency, sustainability, valuation, externalities, governmental policies, and benefit cost analysis.

AGEC 21700 Economics Sem. 1 and 2. SS. Class 3, cr. 3.

National economic problems such as unemployment, recessions, inflation, taxation, bank interest rates, the growth of government, monetary systems, and a rising national debt are discussed along with the principles, policies, and institutions for solving these macroeconomic problems.

AGEC 22000 Economics of Agricultural Markets Sem. 1 and 2. Class 3, cr. 3. Prerequisite: AGEC 10000 or AGEC 20300 or 20400 or ECON 25100.

This class provides an overview of U.S. and international agricultural markets, and develops a framework for analyzing those markets. Concepts include determination of agricultural prices; spatial dimensions of agricultural markets, and trade; temporal dimensions of agricultural markets, and futures and option markets; and public policy in agricultural markets.

AGEC 25000 Economic Geography of World Food and Resources Sem. 1 and 2. Class 3, cr. 3.

A study of the important issues and economic decisions about worldwide resource use for food and fiber production as influenced by geography, climate, history, social institutions, national self-interest, and the environment.

AGEC 27500 Honors Course – Lower Division Sem. 1 and 2. SS.

Utilized to offer a new honors course for a maximum of three years. Variable title, credit, and instructional type. Course may be repeated for credit if content and titles are different. Offered primarily to first and second year students. Courses offered must be approved by departmental or program faculty and College of Agriculture Honors Committee. Enrollment in Honors program.

AGEC 28900 Foundational Internship Sem. 1 and 2. SS. Class 1, cr. 1.

Foundational internship that is preplanned and conducted under the direction of a faculty or staff member working in cooperation with an employer representative. A learning plan must be developed and approved by the student, faculty or staff coordinator, and employer representative prior to beginning the internship. A comprehensive report describing the management strategies used by the company or organization where he/she spent their internship is required. Sophomore standing and consent of faculty or staff coordinator required.

AGEC 29600 Selected Topics in Agricultural Economics Sem. 1 and 2. Class 1–3, cr. 1–3.

Special topics in agricultural economics aimed at sophomore-level students. May be repeated for credit under a different topic title.

AGEC 29800 Sophomore Seminar Sem. 1. Class 2, cr. 1.

Current agricultural economics issues will be analyzed and discussed. Issue areas will be related to individual career planning and program development.

Undergraduate Level/Upper-Division Courses

AGEC 30500 Agricultural Prices Sem. 1. Class 2, lab. 1, cr. 3. Prerequisite: AGEC 22000 and (STAT 22500 or STAT 30100 or STAT 50100).

Analysis of prices and the movement of farm product prices; relations of farm product prices to farm input and other prices; conceptual and statistical analysis of agricultural supply and demand relationships; application of price analysis, price forecasting, agricultural outlook, agricultural policy; adjustment of farming to new price conditions.

AGEC 31000 Farm Organization Sem. 1 and 2. Class 2, lab. 2, cr. 3 (el. 4 to 8 A).

Economic factors controlling success in farming; types of farming; business records and analysis; adjustment in organization to meet changing economic conditions; organization and management of successful farms.

AGEC 31100 Accounting for Farm Business Planning Sem. 1. Class 2, lab. 2, cr. 3.

This course emphasizes the development of procedures for providing and using data in decision making. Methods will be addressed for finding and organizing both financial and physical data to provide the business information needed in planning and control. Topics discussed include budgeting, reporting unit costs of production, measuring profitability and wealth accumulation, estimating credit needs and income tax liability, and evaluating the strengths and weaknesses of the business as the basis for improving the business. A computerized commercial farm business accounting package will be thoroughly presented.

AGEC 32100 Futures and Options Market Applications Sem. 1. Class 3, cr. 2. Prerequisite: AGEC 10000 or AGEC 20300 or 20400, or ECON 25100.

An in-depth background on the origin, operation, and application of futures and options in risk management for agriculture. Covers grain, livestock, and yield futures and options. Applications of futures and options to price and yield risk management is provided. Comparison of expected results from various risk management alternatives and decision-making processes to use in selecting a risk management strategy. Course meets during weeks 1–10.

AGEC 33000 Management Methods for Agricultural Business Sem. 1 and 2. Class 3, cr. 3 (el. 3 to 8 A).

Management of nonfarm, agriculturally related businesses. Topics include tools for management decision making, legal forms of business organization, basics of accounting, and important financial management techniques. Case studies and computer simulation game.

AGEC 33100 Principles of Selling in Agricultural Business* Sem. 1 and 2. Class 3, cr. 3. Prerequisite: sophomore standing.

The principles of salesmanship and their application to the agricultural business. Topics include attitudes and value systems, basic behavioral patterns, the purchase decision process, relationship of sales to marketing, selling strategies, preparing for sales calls, making sales presentations, handling objections, and closing sales. Emphasis is placed on application of principles to real-world situations and on building selling skills through class projects.

AGEC 33300 Food Distribution — A Retailing Perspective Sem. 2. Class 3, cr. 3. Prerequisite: AGEC 31100 or MGMT 20000.

Distribution factors that affect the food industry. Particular attention to the food wholesaling and retailing sectors. Presentation of economic tools to evaluate performance in the food industry. Discussion of the relative importance of each of the major departments in the modern supermarket. Discussion of current and future industry prototypes.

AGEC 34000 International Economic Development Sem. 2. Cr. 3. Prerequisite: AGEC 10000 or AGEC 20300 or AGEC 20400 or AGEC 21700 or ECON 21000 or ECON 25100 or ECON 25200.

This course is designed to introduce students to issues and problems related to international economic development. Topics covered include a description of the current situation in developing countries and the history of growth and development. The course is grounded in the body of theory associated with economic development, but concentrates on the many practical problems such as poverty, population growth, urbanization, education and environment. The three areas with the greatest attention are agricultural development, international trade, and policy analysis for developing countries.

AGEC 35200 Quantitative Techniques for Firm Decision Making Sem. 1 and 2. [Class 2, lab. 1, cr. 3.] or [Class 2, ind. 1, cr. 3.] Prerequisite: STAT 22500 or STAT 30100 or STAT 50100.

Introduction to mathematical programming and computing as an aid to agricultural decision making by firms, linear programming, game theory and strategy, simulation, the waiting-line problem, the equipment replacement decision, and multiproduct scheduling methods. (Alternate course configuration available.)

AGEC 37500 The Process of Economic Research Sem. 1. Class 1, cr. 1. Prerequisite or corequisite: (STAT 22500 or STAT 30100 or STAT 50100) and MA 22400.

This course is designed to assist students considering honors research. The course is a study of the process of conducting economic research. The course examines the research problem and objectives, literature review, conceptual framework, methods and procedures, and reporting research. Students will identify a research topic and project advisor. For Honors program students only in Agricultural Economics. Consent of Instructor.

AGEC 39000 Cooperative Professional Programs in Agricultural Economics Sem. 1 and 2. SS. Cr. 0. Consent of departmental cooperative professional program coordinator required.

Supervised professional experiences in agricultural economics. Programs must be preplanned and conducted under the direction of the departmental coordinator with the cooperation of an employer. Students must submit a summary report.

AGEC 40000 Agricultural Economics Study Abroad Sem. 1 and 2. SS. Cr. 0–8. May be repeated for credit.

Utilized to record credits earned through participation in Purdue study abroad programs with cooperating foreign universities.

AGEC 40600 Natural Resource and Environmental Economics (FNR 40600) Sem. 1 and 2. Class 3, cr. 3. Prerequisite: AGEC 10000 or AGEC 20300 or 20400, or ECON 25100.

Introduction to economic models of renewable and nonrenewable natural resources and the use of these models in the analysis of current resource use and environmental issues.

AGEC 41000 Agricultural Policy Sem. 2. Class 3, cr. 3. Prerequisite: (AGEC 21700 and ECON 25200) and AGEC 22000.

Economic analysis of U.S. food and agricultural policy; current and past farm legislation; international trade; agricultural policies in selected countries; domestic and foreign food assistance; structural change; agricultural research policy; macroeconomic linkages with the agricultural sector; and emerging environmental policy issues, land and water use.

AGEC 41100 Farm Management Sem. 1. Class 2, lab. 4, cr. 4 (el. 7 A). Prerequisite: AGEC 31000, and 31100 or MGMT 20000.

Principles of farm organization and management, farmer interviews, and the application of computerized farm decision-making methods.

AGEC 41200 Farm Business Management Workshop Sem. 2. Cr. 1–3. Prerequisite: (AGEC 31000 or AGEC 33000 or AGEC 41100 or ENTR 20000) and (AGEC 31100 or MGMT 20000).

Making decisions regarding the organization and operation of farm businesses with which students will be associated after graduation. Areas of decision making include enterprise selection, farm growth, organizing large-scale farms, communication, labor management, machinery management, operating agreements, legal organization, and tax strategies.

AGEC 41400 Farm Appraisal Sem. 2. Class 1, lab. 2, cr. 2 (el. 6 or 8 A).

Nature of the real estate market, factors affecting value, valuation problems, appraisal theory and techniques, methods of establishing market values, plus farm building valuation, property insurance, assessment, farm loans, and condemnation appraisals.

AGEC 41500 Community and Resource Development Sem. 2. Class 3, cr. 3 (el. 4, 6, or 8 A). Prerequisite: AGEC 22000.

Principles and structures of group decision making for improving income and quality of living for people, including analysis of private and public interest in economic and social planning.

AGEC 42000 Grain and Grain Products Marketing* Sem. 1. Class 3, cr. 1. Prerequisite: AGEC 32100.

Fundamental and technical analysis of agricultural commodity prices. Role of supply and demand in determining market prices, futures markets in relation to cash markets, and analysis of alternative forward pricing methods. Interpretation of government crop and livestock reports, use and limitations of technical analysis in price forecasting. Course meets during weeks 11–15.

AGEC 42100 Livestock and Meat Marketing Sem. 2. Class 3, cr. 1. Prerequisite: AGEC 32100.

Livestock and meat marketing system, including prices, forecasting, buying and selling, carcass marketing, futures market, and wholesale and retail channels. Marketing problems are identified and analyzed. Basic principles are developed and applied to the problems. Course meets during weeks 1–5.

AGEC 42200 Technical Price Analysis Sem. 2. Class 3, cr. 1. Prerequisite: AGEC 32100.

Theory and application of technical tools to the analysis of price movements. Technical price analysis techniques including use of volume, open interest, bar charts, the relative strength index, stochastics, point and figure charts, and contrary opinion will be presented. The orientation is toward agricultural futures and options users who want to develop a better understanding of how and when to use these tools. Course meets during weeks 6–10.

AGEC 42300 Agricultural Cooperation Sem. 2. Class 3, cr. 1. Prerequisite: AGECE 22000.

History of cooperatives, theory, and principles; problems of Indiana cooperatives; cooperative marketing and purchasing; factors contributing to the success of cooperatives. Course meets during weeks 11–15.

AGEC 42400 Financial Management of Agricultural Business Sem. 1 and 2. Class 3, lab. 2, cr. 4 (el. 5 A). Prerequisite: AGECE 31100 or MGMT 20000.

A study of the major types of financial decisions made by agriculturally related firms, including investment in inventory, receivables and cash, property, plant, and equipment; sources and types of short-term, intermediate, and long-term capital; legal patterns of the business organization, emphasis on implementation involving agribusiness case problems.

AGEC 42500 Estate Planning and Property Transfer Sem. 1. Class 3, cr. 3 (el. 5 or 7 A).

The ownership and transfer of farm business property. Includes tax and other implications of life estates, trust arrangements, sale of property, and charitable contributions.

AGEC 42600 Marketing Management of Agricultural Business Sem. 1 and 2. Class 3, cr. 3. (el. 7 or 8). Prerequisite: (AGECE 31100 or MGMT 20000) and (AGECE 22000 or ENTR 20000) or senior standing.

A study of the major types of marketing strategy decisions that must be made by agribusiness firms, including target market selection; marketing research; sales forecasting; product policies; distribution channels; pricing, advertising, and personal selling; and marketing control.

AGEC 42700 Advanced Agribusiness Marketing Sem. 1. Lab. 4, cr. 2. Prerequisite or corequisite: AGECE 42600 or MGMT 32300. May be repeated for credit.

Application of marketing principles to market planning, research, and analysis. Development of strategic marketing plans for agribusiness.

AGEC 42800 Vertical Coordination Sem. 2. Class 3, cr. 1. Prerequisite: AGECE 22000 and 32100.

Study of the vertical relationships between firms and/or individuals in the agricultural marketing chain. The focus is on firm and individual decision making in the context of a broad view of the U.S. and world food systems. Contracting, alliances, and vertical integration will be studied with extensive use of cases to illustrate the concepts. Students will be challenged to evaluate alternative coordination arrangements with respect to cost, income distribution, risk, and responsiveness to changing consumer preferences. Course meets during weeks 6–10.

AGEC 42900 Agribusiness Marketing Workshop Sem. 2. Lab. 4, cr. 2. Prerequisite: AGECE 42700.

Research, development, and presentation of a strategic agribusiness marketing plan. May be repeated for credit.

AGEC 43000 Agricultural and Food Business Strategy Sem. 1 and 2. Class 3, cr. 3 (el. 6 or 8 A). Prerequisite: (AGECE 42400 or MGMT 30000) and (AGECE 42600 or MGMT 32300).

An advanced course in business planning and strategy for potential agribusiness and food firm managers. Focuses on development of viable business strategy in the context of the firm's market and its internal condition. Makes extensive use of case studies that document management dilemmas of agribusiness firms, ranging from those providing inputs to agricultural producers to firms involved in the retail distribution of food.

AGEC 43100 Advanced Agri-Sales and Marketing* Sem. 1. Class 4, cr. 4. Prerequisite: AGECE 33100 and (AGECE 42600 or MGMT 32300). For sales and marketing majors classified 7 or 8.

Advanced techniques of salesmanship, field application of selling techniques, improving communication skills, study of agribusiness marketing strategies, interaction with industry agri-marketers, and strategies for career development in agri-marketing.

AGEC 43300 Executive in the Classroom Sem. 1. Class 1, cr. 1.

Students meet weekly with industry leaders in the food processing, wholesaling, and retailing industries. Discussion of management philosophies and strategies, exploration of career opportunities, and review of trends, issues, and problems in the contemporary food industry. Students participate in the Midwest Grocers Association and the Food Marketing Institute trade shows.

AGEC 43500 Leadership in A Changing World Sem. 2. Class 3, cr. 3. Prerequisite: Senior standing.

An examination of various leadership theories and the importance of leadership. Drawing upon research from many disciplines and fundamental aspects of leadership, students will read, discuss, and apply these concepts to leadership experiences and to develop the competencies to be more effective leaders in their family, workplace, and community.

AGEC 44000 Advanced Futures Topics Sem. 2. Class 3, cr. 1. Prerequisite: AGECE 32100.

Macro issues concerning the role of futures markets in price formation and as a business management tool. Topics include why the markets work, price formation in futures, regulation of futures, interest rate futures, speculative pricing, risk management, and equity financing. Course meets during weeks 11–15.

AGEC 45000 International Agricultural Trade Sem. 1. Class 3, cr. 3 (el. 5 or 7 A). Prerequisite: (AGECE 21700 or ECON 25200) and (AGECE 10000 or AGECE 20300 or AGECE 20400 or ECON 25100).

Study of U.S. agricultural trade with emphasis on international trade theory, exchange rates and their determination, relationships between domestic agricultural policies and trade policies, and analysis of institutional arrangements for world trade in agricultural products.

AGEC 45100 Applied Econometrics Sem. 2. Class 2, lab. 1, cr. 3. Prerequisite: STAT 22500 or STAT 30100 or STAT 50100.

Application of strategies to economic problems. Simple and multiple regression, dummy variables, logit analysis, time series, and forecasting.

AGEC 45500 Agricultural Law Sem. 1. Class 3, cr. 3. Prerequisite: Junior or Senior Standing

Selected general legal topics (courts, contracts, torts, property and commercial law) with emphasis on farming problems (e.g., landowner-tenant, grain contracts, fences, and animal liability) and cases.

AGEC 45600 Federal Income Tax Law Sem. 2. Class 3, cr. 3. Prerequisite: Junior or Senior Standing.

Introduction to the federal income tax laws applicable to individuals and small business with emphasis on the farming business. The course includes management implications and the policy basis for the tax law system. Techniques and practice for the preparation of selected forms will be included. There will be limited exposure to taxation of partnerships, corporations, estates, and to federal gift and estate tax law.

AGEC 47500 Honors Course – Upper Division Sem. 1 and 2. SS. cr. 1 -4.

Utilized to offer a new honors course for a maximum of three years. Variable title, credit, and instructional type. Course may be repeated for credit if content and titles are different. Offered primarily to third and fourth year students. Courses offered must be approved by departmental or program faculty and College of Agriculture Honors Committee. Enrollment in Honors program. Departmental approval required to register.

AGEC 48900 Professional Internship Sem. 1 and 2. SS. Class 1, lab. 2, cr. 2. Prerequisite: AGEC 28900, or junior standing and consent of faculty or staff coordinator required. May be repeated for a maximum of four credits.

Foundational internship that is preplanned and conducted under the direction of a faculty or staff member working in cooperation with an employer representative. A learning plan must be developed and approved by the student, faculty or staff coordinator, and employer representative prior to beginning the internship. A summary report describing their economic or business analysis for the company or organization where he/she spent their internship is required.

AGEC 49000 Computer Applications in Agricultural Decision Making Sem. 1 and 2. SS. Cr. 1–3. May be repeated for a total of not more than six credits.

Intensive study of various computerized decision-making models and information systems and their application to agricultural situations.

AGEC 49600 Selected Topics in Agribusiness Management Sem. 1 and 2. Class 3, cr. 1 (five-week session). May be repeated for up to six credits.

Intended for individuals in the food industry marketing and management, sales and marketing, agribusiness management, agricultural finance, and farm management options. Also open to students in other agricultural economics options as well as to students outside the department. Focuses on current topics in the management of food and agribusiness firms. Provides advanced treatment of these topics for upper-division students. This is a set of one-hour seminars that will address current topics in food and agribusiness management. The topics of focus will be those that either are not treated in other courses, or are not treated in depth needed by a student pursuing a management career in the food and agribusiness industries. Topics will be reviewed annually as to relevance and will be changed as needed.

AGEC 49800 Special Problems Sem. 1 and 2. SS. Cr. 1–3 (el. 7 or 8 A). May be repeated for a maximum of six credits.

Open primarily to qualified seniors who want to study special problems in agricultural economics not covered in regular work.

AGEC 49900 Thesis Sem. 1 and 2. SS. Cr. 1–6. Prerequisite: Admission to honors program.

For honors students doing individualized research. Advisor designator required. Can be repeated for additional credit.

Dual Level/Undergraduate-Graduate

AGEC 50600 Agricultural Marketing and Price Analysis Sem. 2. Class 3, cr. 3. Prerequisite: AGEC 22000, ECON 34000; STAT 30100 or 50100, or equivalents.

Marketing margins and derived demand; elasticity. Modeling supply and demand relationships, single and multiple equation systems forecasting. Industrial organization economics applied to the food processing, wholesaling, and retailing industries; subsector analysis, vertical coordination; market and competition policies.

AGEC 52400 Agricultural Finance Sem. 2. Class 3, cr. 3 (el. 6 or 8 A). Prerequisite: AGEC 42400 or equivalent.

Designed to provide students the concepts and tools to apply financial management principles to farm businesses. Topics include financing alternatives, preparation and interpretation of financial statements, and capital investment analysis using discounted cash flows.

AGEC 52500 Environmental Policy Analysis Sem. 2. Class 3, cr. 3. Prerequisite: introductory microeconomics course.

Course is designed to assist in understanding how environmental information and knowledge are produced, disseminated, and utilized in a variety of institutional contexts. Readings are selected to promote discussion and interaction concerning alternative mechanisms for protecting environmental resources.

AGEC 52600 International Food and Agribusiness Marketing Strategy Sem. 1. Class 3, cr. 3. Prerequisite: AGECE 42600 or equivalent and STAT 30100 or 50100.

Students will develop their analytical, decision making, and communication skills related to marketing management of food systems in the world economy. They will analyze a foreign market's potential and market entry strategies; compare consumer differences and similarities across markets; define issues related to marketing mix standardization or adaptation; and evaluate effects of economic, social, and legal environments on marketing strategy.

AGEC 53000 Strategic Agribusiness Management Sem. 1. Class 3, cr. 3. Prerequisite: AGECE 42400 or equivalent.

Course addresses issues in the strategic management of agricultural and food businesses. Emphasis is on developing a framework for formulating strategy, making strategic choices in a variety of business environments, and implementing strategy. Extensive use of management case studies and a major term project with an agribusiness firm focus on developing managerial problem solving skills.

AGEC 53300 Supply Chain Management for Food and Agribusiness Sem. 2. Class 3, cr. 3. Prerequisite: AGECE 55200 and STAT 50100, or equivalents.

Students will develop an understanding of how the theory of logistics is applied as supply chain management for food and agribusiness firms. Through case studies and problem sets, students will analyze and consider contemporary issues and problems. Analyses will focus on tradeoffs among customer service, forecasting, inventory control, information technology, transportation management, warehousing and materials handling, and supply chain planning.

AGEC 55200 Introduction to Mathematical Programming Sem. 1. Class 3, pso. 1, cr. 3.

Introduction to constrained optimization problems and their solution using mathematical programming techniques. Theory and implementation of linear, quadratic, and integer programming methods are examined. Applications to farm management, diet and feed rations, spatial market equilibrium, agricultural sector analysis and other problems from agricultural economics. Use of computer software packages for practical problems.

AGEC 55400 Applied Simulation Techniques in the Agriculture Industry SS. Class 2, cr. 2.

Develops proficiency in the design, construction, use, and evaluation of simulation models of economic systems. Emphasis is on risk into economics and business decisions. The primary focus is on the development of simulation models of agricultural economics systems, using Excel spreadsheet and @Risk software packages.

AGEC 59600 Seminars in Current Issues in Agricultural Economics Sem. 1 and 2. SS. Class 1–3, cr. 1–3. May be repeated for additional credit.

A study of selected current developments in agricultural economics. Topics will be announced in advance.

Agriculture

Undergraduate Level/Lower-Division Course

AGR 10100 Introduction to the College of Agriculture and Purdue University Sem. 1. Class 1, cr. 0.5. Course meets during weeks 1–8. Co-requisite: One course selected from AGR 11100 to AGR 12400

Students are introduced to the College of Agriculture and Purdue University. Specific areas discussed include the diversity of career opportunities within agriculture, the relationships between different areas of agriculture, ethics, the impact of undergraduate coursework, including the core curriculum, on scholarship and career preparation, and the challenges facing the food, agricultural, and natural resource system. The use of guest lecturers provides a networking opportunity for students. Enrollment in this course is restricted to beginning freshmen students.

AGR 11100 Introduction to Agricultural and Biological Engineering Academic Programs Sem. 1 Class 1, cr. 0.5. Course meets during weeks 1–8. Co-requisite: AGR 10100.

An introduction to academic programs offered in the Department of Agricultural and Biological Engineering which include Agricultural Systems Management, Agricultural and Natural Resource Engineering, and Biological and Food Process Engineering. Topics include, but are not limited to undergraduate plans of study, courses, experiential programs, internships, student organizations, career opportunities, academic policies, scholarships, and student services.

AGR 11200 Introduction to Agricultural Economics Academic Programs Sem. 1, cr. 0.5. Course meets during weeks 1-8. Co-requisite: AGR 10100.

An introduction to academic programs offered in the Department of Agricultural Economics. Topics include, but are not limited to undergraduate plans of study, courses, experiential programs, internships, student organizations, career opportunities, academic policies, scholarships, and student services.

AGR 11300 Introduction to Agronomy Academic Programs Sem. 1. Class 1, cr. 0.5. Course meets during weeks 1-8. Co-requisite: AGR 10100.

An introduction to academic programs offered in the Department of Agronomy which include Applied Meteorology, Agronomic Business and Marketing, Environmental Soil Science, International Agronomy, Plant Genetics and Plant Breeding, Soil and Crop Management, Soil and Crop Science, Turf Science and Associates. Topics include, but are not limited to undergraduate plans of study, courses, experiential programs, internships, student organizations, career opportunities, academic policies, scholarships, and student services.

AGR 11400 Introduction to Animal Sciences Academic Programs Sem. 1. Class 1, cr. 0.5. Course meets during weeks 1-8. Co-requisite: AGR 10100.

An introduction to academic programs offered in the Department of Animal Sciences. Topics include, but are not limited to undergraduate plans of study, courses, experiential programs, internships, student organizations, career opportunities, academic policies, scholarships, and student services.

AGR 11500 Introduction to Biochemistry Academic Programs Sem. 1. Class 1, cr. 0.5. Course meets during weeks 1-8. Co-requisite: AGR 10100.

An introduction to academic programs offered in the Department of Biochemistry. Topics include, but are not limited to undergraduate plans of study, courses, experiential programs, internships, student organizations, career opportunities, academic policies, scholarships, and student services.

AGR 11600 Introduction to Botany and Plant Pathology Academic Programs Sem. 1. Class 1, cr. 0.5. Course meets during weeks 1-8. Co-requisite: AGR 10100.

An introduction to academic programs offered in the Department of Botany and Plant Pathology. Topics include, but are not limited to undergraduate plans of study, courses, experiential programs, internships, student organizations, career opportunities, academic policies, scholarships, and student services.

AGR 11700 Introduction to Entomology Academic Programs Sem. 1. Class 1, cr. 0.5. Course meets during weeks 1-8. Co-requisite: AGR 10100.

An introduction to academic programs offered in the Department of Entomology. Topics include, but are not limited to undergraduate plans of study, courses, experiential programs, internships, student organizations, career opportunities, academic policies, scholarships, and student services.

AGR 11800 Introduction to Food Science Academic Programs Sem. 1. Class 1, cr. 0.5. Course meets during weeks 1-8. Co-requisite: AGR 10100.

An introduction to academic programs offered in the Department of Food Science. Topics include, but are not limited to undergraduate plans of study, courses, experiential programs, internships, student organizations, career opportunities, academic policies, scholarships, and student services.

AGR 11900 Introduction to Forestry and Natural Resources Academic Programs Sem. 1. Class 1, cr. 0.5. Course meets during weeks 1-8. Co-requisite: AGR 10100.

An introduction to academic programs offered in the Department of Forestry and Natural Resources. Topics include, but are not limited to undergraduate plans of study, courses, experiential programs, internships, student organizations, career opportunities, academic policies, scholarships, and student services.

AGR 12000 Introduction to Horticulture and Landscape Architecture Academic Programs Sem. 1. Class 1, cr. 0.5. Course meets during weeks 1-8. Co-requisite: AGR 10100.

An introduction to academic programs offered in the Department of Horticulture and Landscape Architecture. Topics include, but are not limited to undergraduate plans of study, courses, experiential programs, internships, student organizations, career opportunities, academic policies, scholarships, and student services.

AGR 12100 Introduction to Youth Development and Agricultural Education Academic Programs Sem. 1. Class 1, cr. 0.5. Course meets during weeks 1-8. Co-requisite: AGR 10100.

An introduction to academic programs offered in the Department of Youth Development and Agricultural Education which include Agricultural Communication and Agricultural Education. Topics include, but are not limited to undergraduate plans of study, courses, experiential programs, internships, student organizations, career opportunities, academic policies, scholarships, and student services.

AGR 12200 Introduction to Natural Resources and Environmental Science Academic Programs Sem. 1. Class 1, cr. 0.5. Course meets during weeks 1-8. Co-requisite: AGR 10100.

An introduction to academic programs offered in Pre-Environmental Studies and Natural Resources and Environmental Science. Topics include, but are not limited to undergraduate plans of study, courses, experiential programs, internships, student organizations, career opportunities, academic policies, scholarships, and student services.

AGR 12300 Introduction to the College of Agriculture Interdisciplinary Agriculture Program Sem. 1. Class 1, cr. 0.5. Course meets during weeks 1-8. Co-requisite: AGR 10100.

An introduction to the Interdisciplinary Agriculture program offered by the College of Agriculture. Topics include, but are not limited to undergraduate plans of study, courses, experiential programs, internships, student organizations, career opportunities, academic policies, scholarships, and student services.

AGR 12400 Introduction to the College of Agriculture Pre Veterinary Medicine Program Sem. 1. Class 1, cr. 0.5. Course meets during weeks 1-8. Co-requisite: AGR 10100.

An introduction to the Pre Veterinary Medicine program offered by the College of Agriculture. Topics include, but are not limited to undergraduate plans of study, courses, experiential programs, internships, student organizations, career opportunities, academic policies, scholarships, and student services.

AGR 20100 Communicating Across Culture Sem. 1 and 2. Class 2, lab. 2, cr. 3.

This course will provide students with an opportunity to understand their place in a multicultural, multiethnic, multinational country, the United States. It is designed to provide an academic overview of the field of multicultural education as it evolved to this day. The course will offer an introductory overview of the many differences that exist within all human beings. Because the diversity among individuals is endless, we can not study all differences, but will study a sampling such as race/ethnicity, gender identity, age, social class, disability, learning styles, and religion/spiritual orientation. Issues of poverty, language, and social justice may also be examined in relationship to the above major areas of emphasis.

AGR 29000 Special Topics in Agriculture Sem. 1 and 2. SS. Credit 0–3. May be repeated for a maximum of three credits.

Presentation of subject matter not available in other courses offered by the college. The specific topic that is offered will be indicated on the student's academic record.

Undergraduate Level/Upper-Division Courses

AGR 40000 Agriculture Study Abroad Sem. 1 and 2. SS. Credit 0–8. May be repeated for credit.

Utilized to record credits earned through participation in Purdue study abroad programs with cooperating foreign universities.

AGR 49000 Special Problems Sem. 1 and 2. SS. Credit 0–3. May be repeated for a maximum of three credits.

Topics and credits to be arranged.

AGR 49300 Special Topics in International Agriculture Sem. 1 and 2. SS. Class 1–3, cr. 0–3. Prerequisite: consent of instructor. May be repeated for a maximum of six credits.

A course that provides students interested in international agriculture opportunity for in-depth study and analysis of major issues associated with the relationship of U.S. agriculture to world agriculture and agricultural development abroad. Current and significant topics will be selected.

AGR 49500 International Professional Experience in Agriculture, Food, or Natural Resources Sem. 1 and 2. SS. Cr. 0. Consent of the School of Agriculture international professional experience program coordinator required.

Supervised international professional experiences in agricultural, food, or natural resource disciplines. The professional experience period must be preplanned and conducted under the supervision of a School of Agriculture faculty member. Students must submit a summary report.

AGR 49600 Multicultural Professional Experience Sem. 1 and 2. Experiential or Individual Study, cr. 0.

The multicultural professional experience must be pre-planned and conducted under the supervision of a College of Agriculture faculty member. Students must submit a summary report.

Agronomy

Undergraduate Level/Lower-Division Courses

AGRY 10500 Crop Production Sem. 1 and 2. Class 2, lab. 2, atsp 1, cr. 3 (el. 1 or 2 A).

Fundamental principles of crop production and distribution. Emphasis is placed on applying technological advances in agronomy to active crop-production situations, including basic soils, agricultural meteorology, and crop physiology and breeding.

AGRY 11000 Survey of Turfgrass Culture Sem. 1. Lab. 2, cr. 1.

A survey of the challenges and opportunities available in the turfgrass industry. Students will visit a wide range of turf sites to see turf problems and their solutions. Professional turf managers, upper class undergraduate students, and faculty will share their experiences with the class to provide a broad perspective of the turf industry to the students.

AGRY 15500 Introduction to Soil Morphology Sem. 1. Lab. 5, cr. 2.

This course features an introductory field experience in evaluating soil morphology. Students will develop skills determining horizon nomenclature, texture, soil color, structure, consistence, and drainage. Basic concepts regarding the impact of soil morphology on use of soils for various purposes will be presented. Collegiate soil judging is a portion of the subject matter discussed.

AGRY 20400 Crop and Weed Identification (BTNY 20400) Sem. 2. Lab. 4, cr. 1 or 2.

The identification by sight of plant mounts and seeds of over 200 crops and weeds is taught. The first eight weeks, which covers restricted weeds, prohibited noxious weeds, common weeds, and seed diseases, can be taken for one credit; the last eight weeks covers cereals, grass and legume forages, and legume crops. The list of species to be studied for two credits is obtained from the Intercollegiate Crops Judging Manual. The species to be covered for one credit include the above-listed weeds and additional weed specimens pertinent to the weeds contest. The use and origins of the species are discussed briefly. Suggested course in preparation for AGRY 30500 Seed Analysis and Grain Grading.

AGRY 21000 Fundamentals of Turfgrass Culture Sem. 2. Class 3, cr. 3.

An introductory course in turfgrass management emphasizing turfgrass growth and development, species characteristics, their adaptation and basic cultural requirements for ornamental and functional turfgrass areas. The requirements and cultural inputs needed for proper establishment and maintenance of a high quality, low maintenance lawn will be discussed.

AGRY 21100 Fundamentals of Turfgrass Culture Laboratory Sem. 2. Lab. 3, cr. 1. Prerequisite or corequisite: AGRY 21000.

Companion lab to AGRY 21000. Laboratory exercises will focus on turfgrass and seed anatomy, morphology, identification as well as the hands-on basic principles of turfgrass culture. Designed for the student who intends to pursue a career in turfgrass management and plans to enroll in AGRY 51000. Enrollment preference will be given to Turfgrass Science majors.

AGRY 25100 Introduction to Soils Sem. 1 and 2. Class 1, rec. 1, lab. 3, cr. 1. Course meets during weeks 1–6. Credit not given for both AGRY 25100 and 25500 or 27000.

Characteristics of soils and their landscapes; soil genesis and classification; relation of soils to land use; soil management relative to erosion, tillage, drainage, moisture supply, and aeration. The first six weeks of AGRY 25500.

AGRY 25500 Soil Science (NRES 25500) Sem. 1 and 2. Class 1, rec. 1, lab. 3, cr. 3. Prerequisite: CHM 11200 or CHM 11600.

Differences in soils; soils genesis; physical, chemical, and biological properties of soils; relation of soils to problems of land use and pollution; soil management relative to tillage, erosion, drainage, moisture supply, temperature, aeration, fertility, and plant nutrition. Introduction to fertilizer chemistry and use. Not available to students who have taken AGRY 27000.

AGRY 27000 Forest Soils Sem. 2. Class 1, rec. 1, lab. 3, cr. 3. Prerequisite: CHM 11200 or CHM 11600. Not available to students who have taken AGRY 25500 or NRES 25500.

Development, distribution, and classification of soil profile; soil characteristics related to forest practices; nature and cause of soil differences; fertility and plant nutrition.

AGRY 28500 World Crop Adaptation and Distribution Sem. 2. Class 3, cr. 3.

Examination of how environmental factors, including climate and soils, impact the global distribution of major food crops. Identification of the types of naturally occurring plant communities and comparison of these communities with those of environmentally and economically sound field cropping systems. Exploration of how man's intervention has maintained or modified the productivity of food crops in agricultural communities and how his intervention has affected the environment.

AGRY 29000 Introduction to Environmental Science (EAS 11300, NRES 29000) Sem. 1. Class 3, cr. 3.

An introduction to environmental science, including issues such as air and water pollution, toxic waste disposal, soil erosion, natural hazards, climate change, energy resources, and environmental planning. Includes extensive in-class discussion of case studies.

Undergraduate Level/Upper-Division Courses

AGRY 30500 Seed Analysis and Grain Grading Sem. 1. Lab. 4, cr. 2.

A practical study of factors influencing commercial grain quality and purity of seed lots. Training in the ability to recognize crop products for their market worth by knowing defects that reduce grain quality. Purity analysis of seed lots will be performed. In-depth identification of 200 crops and weeds important to United States agriculture. Intercollegiate crops judging is a portion of the subject matter discussed.

AGRY 30600 Seed Technology Sem. 1. Lab. 3, cr. 2.

An introduction to the seed industry with emphasis on morphological development, production, cleaning, and testing as well as storage and merchandising techniques.

AGRY 31100 Turfgrass Diagnostics Sem. 2. Class 1, cr. 1. Prerequisites: AGRY 21000 (may be repeated for up to 2 credits)

An intermediate to advanced level course covering relevant applied problem solving skills required to be a professional turfgrass manager.

AGRY 32000 Genetics Sem. 1 and 2. Class 3, cr. 3. Prerequisite or corequisite: (BIOL 11000 and 11100) or (BIOL 11000 and BTNY 21000) or (BIOL 11100 and BTNY 21000) or (BIOL 12100 and BIOL 13100) or (BTNY 21000 and HORT 30100).

The transmission of heritable traits; probability; genotypic-environmental interactions; chromosomal aberrations; polyploidy; gene mutations; genes in populations; the structure and function of nucleic acids; biochemical genetics; molecular genetics; coding.

AGRY 32100 Genetics Laboratory Sem. 1 and 2. Lab. 3, cr. 1. Prerequisite or corequisite: AGRY 32000.

Experiments with plants and microorganisms to elucidate the basic concepts of molecular and classical genetics as applied to genome analysis.

AGRY 33500 Weather and Climate Sem. 2. Class 3, cr. 3. Prerequisite or corequisite: PHYS 15200 or PHYS 21400 or PHYS 22000.

An introductory course in meteorology and climatology with applications to daily life. The study of the fundamental physical principles behind weather and climate and how they apply to the homeowner and the world citizen. Emphasis is on how to interpret weather conditions and forecasts, what controls the wide range of climates in the world, and what the future may hold.

AGRY 33700 Environmental Hydrology Sem. 2. Class 3, cr. 3.

This course is designed to provide undergraduate students with both the basics of how water moves through the environment and current theories as to how hydrologic response is modified by environmental change at a variety of temporal and spatial scales.

AGRY 34900 Soil Ecology Sem. 1. Class 2, lab. 3, cr. 3. Prerequisite or corequisite: (BIOL 11000 and BIOL 11100) or (BIOL 11000 and BTNY 21000) or (BIOL 11100 and BTNY 21000) or (BIOL 12100 and BIOL 13100) or (BTNY 21000 and HORT 30100).

An introductory course that will cover the basic concepts of soil ecology. Biological diversity and the interactions between and within biotic and abiotic components of the soil ecosystem, nutrient cycling, and genetic engineering are introduced.

AGRY 35000 Global Awareness Sem. 2. Class 1, ind. 2, cr. 1–3. May be repeated once with consent of instructor. A maximum of four credits may be earned.

A seminar-type course about world geography, cultures, and agriculture. Speakers are selected from the many Purdue graduate students and visiting scholars from around the world. Extra credit may be earned through independent study of a global issue.

AGRY 35500 Soil Morphology and Geography* Sem. 1. Lab. 5, cr. 2.

This course features field experience in advanced techniques in soil morphology including the study of the relationship of soils to landscapes, common parent materials of the Midwest and classification of soils in the Soil Taxonomy. Course material emphasizes the development of detailed descriptions of soil properties and how these properties directly impact the interpretations and recommendations for land use options. Use and management of soils based on landscape position and methodology will be covered including on-site waste disposal, homes with basements as well as road and street construction. Collegiate soil judging is a portion of the subject matter discussed.

AGRY 36500 Soil Fertility Sem. 2. Class 2, lab. 2, cr. 3. Prerequisite: AGRY 25500 or 27000.

Principles of soil chemistry and physics influencing plant nutrition; emphasis on diagnosis and solution of problems on soil reaction and nutrient status; fertilizer chemistry and use; reaction of pesticides and growth regulators with soils.

AGRY 37500 Crop Production Systems Sem. 1 and 2. Class 3, cr. 3.

Factors affecting management decisions in crop production systems. Development of small grain and row cropping systems. Interaction of factors affecting efficient production systems, including seed selection, tillage, planting management, pest management, and harvesting and storage considerations.

AGRY 38000 Field Crop Diagnostic Techniques (BTNY 38000, ENTM 38000) SS. Class 1, cr. 1. Prerequisite: (AGRY 10500 or AGRY 37500) and (AGRY 25500 or NRES 25500) and ENTM 20600 and BTNY 30100 and BTNY 30400.

Identification of field crop problems via in-field diagnostic techniques, determination of the magnitude of problems utilizing in-field thresholds, evaluation of optional multidisciplinary management strategies, and development of appropriate strategies based upon economic, environmental, and cultural concepts.

AGRY 38500 Environmental Soil Chemistry (NRES 38500) Sem. 1. Class 3, lab. 3, cr. 4. Prerequisite: (AGRY 25500 or NRES 25500 or AGRY 27000) and (CHM 11200 or CHM 11600).

Designed as an upper level introductory course covering environmental soil chemistry concepts in the framework most applicable to inorganic and organic chemical contamination of soil and water resources and intended for students in environmental science fields that may not have a strong chemistry or and/or mathematics background.

AGRY 39000 Professional Cooperative Programs in Agronomy Sem. 1 and 2. SS. Cr. 0. Consent of the departmental cooperative professional program coordinator required.

Supervised professional experiences in agronomy. Programs must be preplanned and conducted under the direction of the departmental coordinator with the cooperation of an employer. Students must submit a summary report.

AGRY 39800 Agronomy Seminar Sem. 1. Class 1, cr. 1. Open to sophomores and juniors.

Weekly discussions of agronomic topics and other subjects relative to agronomic interest. Students are expected to participate in the discussions.

AGRY 39900 Individual Study Sem. 1 and 2. Cr. 1–3. May be repeated for up to six credits.

Supervised individual study or research over topics not covered in other courses. Arrange with agronomy faculty before registering.

AGRY 40000 Agronomy Study Abroad Sem. 1 and 2. SS. Credit 0–8. May be repeated for credit.

Utilized to record credits earned through participation in Purdue study abroad programs with cooperating foreign universities.

AGRY 43100 Atmospheric Thermodynamics (EAS 42100) Sem. 1. Class 3, cr. 3. Prerequisite: AGRY 33500 and 33600; MA 26100; PHYS 22100, 241, or 25100.

Structure and composition of the atmosphere. Thermodynamics of dry and moist air, including adiabatic and pseudoadiabatic processes, hydrostatic stability, and air mass determination.

AGRY 43200 Atmospheric Dynamics I (EAS 42200) Sem. 2. Class 3, cr. 3. Prerequisite: AGRY 43100 and MA 26200.

A study of the general system of equations governing mass and momentum changes in the atmosphere; special horizontal wind representations; thermal wind relationships; circulation, vorticity, divergence, and vertical motion.

AGRY 43300 Atmospheric Dynamics II (EAS 42300) Sem. 1. Class 3, cr. 3. Prerequisite: AGRY 43200.

An extension of AGRY 43200 with the emphasis on perturbation theory and hydrodynamic stability, air mass and frontal theory, barotropic and baroclinic models, wave cyclone theory, and numerical weather prediction.

AGRY 44100 Synoptic Laboratory I (EAS 43100) Sem. 1. Lab. 3, cr. 1. Corequisite: AGRY 43100.

Analysis of vertical distributions of temperature and moisture with applications to adiabatic and pseudoadiabatic processes, hydrostatic stability, and air mass determination.

AGRY 44200 Synoptic Laboratory II (EAS 43200) Sem. 2. Lab. 3, cr. 1. Prerequisite: AGRY 44100; corequisite: AGRY 43200.

Analysis of horizontal distributions of pressure, temperature, wind, vorticity, and vertical motions. Applications to synopticscale wave propagation.

AGRY 44300 Synoptic Laboratory III (EAS 43300) Sem. 1. Lab. 3, cr. 1. Prerequisite: AGRY 44200; corequisite: AGRY 43300.

Diagnosis of midtropospheric wave propagation and growth. Analysis of surface pressure fields and fronts and their relationships to upper air features. Extensive use is made of teletype and facsimile weather information.

AGRY 44400 Weather Analysis and Forecasting (EAS 43400) Sem. 2. Lab. 9, cr. 3. Prerequisite: AGRY 43300 and 44300.

In-depth study of contemporary weather analysis and forecasting techniques and problems. Extensive use is made of teletype and facsimile data and numerical weather prediction guidance provided by the National Meteorological Center.

AGRY 45000 Soil Conservation and Water Management (NRES 45000) Sem. 1. Class 2, lab. 3, cr. 3. Prerequisite: AGRY 25500 or NRES 25500 or AGRY 27000.

Principles of soil conservation with emphasis on control of soil erosion by wind and water; impact of soil management decisions on environment; soil-water-plant relations, includes agronomic aspects of water management for both irrigation and drainage.

AGRY 46000 Contemporary Issues in Agriculture (ANTH 46000) Sem. 2. Class 3, cr. 3. Prerequisite: junior or senior standing.

Current agricultural issues are examined from a problem-solving standpoint. Class includes discussion and debate of the social, economic, and technological decisions facing agricultural communities. Agricultural issues are examined from a humanistic as well as a scientific viewpoint.

AGRY 46500 Soil Physical Properties Sem. 1. Class 2, lab. 3, cr. 3. Prerequisite: AGRY 25500 or NRES 25500 or AGRY 27000.

Physical properties and processes in soils; water flow, soil structure, chemical movement; principles and methods of physical analysis of soils; the influence of soil physical processes on environmental quality and plant growth.

AGRY 48000 Plant Genetics Sem. 1. Class 3, cr. 3. Prerequisite: AGRY 32000

Principles and recent advances in plant genetics including: genetic segregation, linkage, DNA markers and applications, chromosomes and genomes, variation in chromosome number and structure, mutation, recombination and DNA repair, quantitatively inherited traits, introduction to the principles of population genetics, gene expression, gene organization, regulation of gene activity, gene function, identifying important genes, cloning genes, reverse genetics, plant transformation, applications of genetic engineering, genome sequencing, using sequence data.

AGRY 49800 Agronomy Senior Seminar Sem. 1. Class 1, cr. 1 (el. 7 A).

Weekly discussions and presentations on assigned topics in agronomy, interpersonal interactions, professional ethics, and leadership skills. Student teams will evaluate case studies and present their analyses orally and in writing.

AGRY 49900 Thesis Research Sem. 1 and 2. SS. Cr. 1–6. Prerequisite: admission to honors program. May be repeated for additional credit.

For honors students doing individualized research on agronomic problems; report required. Arrange with academic advisor and honors research advisor before registering.

Dual Level/Undergraduate-Graduate

AGRY 50500 Forage Management Sem. 2. Class 3, cr. 3.

The study of the role of economically important crop species in the soil-plant-animal complex. Physiology, utilization, and management of forage species will be emphasized.

AGRY 51000 Turfgrass Science Sem. 1. Class 2, lab. 3, cr. 3. Prerequisite: AGRY 21000, 21100, and 25500.

An advanced course in turfgrass management which focuses on the management requirements of intensively cultured turfgrass areas, with specific emphasis on golf courses and athletic fields. Interrelationships among soil, plant, and atmospheric environments, management practices and turfgrass quality will be stressed.

AGRY 51100 Population Genetics (ANSC 51100, FNR 51100) Sem. 1. Class 3, cr. 3. Prerequisite: AGRY 32000; corequisite: STAT 50300 or 51100.

Basic concepts of population genetics. Characterization of populations using gene frequencies, gametic and zygotic disequilibrium; forces changing gene frequencies (mutation, migration, selection, and random gene drift) and genotypic frequencies (mating systems: inbreeding, crossbreeding, and phenotypic assortative) and related hypothesis testing; gene trees and the coalescent process; molecular phylogenies.

AGRY 51200 Integrated Turfgrass Systems Sem. 1. Class 3, lab. 5, cr. 3. Prerequisite: AGRY 51000, BTNY 52000, and ENTM 34000. Course meets during weeks 1-10.

Integration of agronomic principles for professionally managing golf courses, athletic complexes, lawn care companies, and sod production facilities in an efficient and environmentally-friendly manner. Emphasizes independent thinking and team cooperation for understanding the social, ethical, and economical aspects underlying the daily agronomic management decisions, including construction, establishment, cultural practices, fertilization, and pest management.

AGRY 51500 Plant Mineral Nutrition Sem. 1. Class 3, cr. 3. Prerequisite: AGRY 36500 and a basic plant physiology course. Offered in even-numbered years.

Fundamental principles and concepts of the mineral nutrition of higher plants; processes and mechanisms controlling nutrient bioavailability and acquisition; physiological, genetic, and ecological aspects of plant nutrition including rhizosphere dynamics and interaction with disease.

AGRY 52000 Principles and Methods of Plant Breeding Sem. 1. Class 2, lab. 2, cr. 3. Prerequisite: AGRY 32000 or equivalent.

Introduction to methods and techniques of breeding field crops, with emphasis on the application of genetic principles; analysis of, and present approach to, the solution of specific breeding problems in selected field crops.

AGRY 52500 Crop Physiology and Ecology Sem. 2. Class 3, cr. 3.

Study of the physiological basis for growth, yield, and adaptation of crop plants. Topics emphasized include: carbohydrate assimilation and partitioning, nitrogen metabolism, crop growth and development, water relations, stress tolerance, and crop improvement using physiological genetics. Basic background in college level plant biology is recommended.

AGRY 53500 Boundary-Layer Meteorology (EAS 52500) Sem. 2. Class 3, cr. 3. Prerequisite: AGRY 33500 and 33600, MA 26100, and PHYS 22100.

A study of the physical nature of the lowest layers of the atmosphere. The energy balance concept and the turbulent transfer of heat, momentum, and water vapor are discussed in detail. Some specific microclimates are studied in the context. This course has required class trips. Students will pay individual lodging or meal expenses when necessary.

AGRY 53600 Environmental Biophysics Sem. 2. Class 2, lab. 2, cr. 3. Prerequisite: BIOL 11000, MA 26100, PHYS 22100.

An analysis of energy fluxes to and from terrestrial plants, insects, mammals, and humans as they exist in their macro and micro climates. Agricultural meteorology methods (both research and operations) will be presented. Labs will be both in-laboratory and in-field with reports required. A special project will be required of all students and will be presented in class and written as if for publication.

AGRY 54000 Soil Chemistry Sem. 2. Class 3, cr. 3. Prerequisite: AGRY 36500.

Emphasis on processes controlling the gaseous, solution, and solid phases in soils, including precipitation, acid-base, oxidation-reduction, complexation, absorption, and ion exchange.

AGRY 54400 Environmental Organic Chemistry Sem. 2. Class 3, cr. 3. Prerequisite: AGRY 25500 or AGRY 27000; CHM 25700.

The fundamental properties and processes responsible for the fate of organic chemicals in the environment with emphasis on soil and water chemistry. Areas to be addressed will include both conceptual and theoretical aspects of processes relevant to environmental fate of contaminants; measurement, estimation, correlation, and application of the parameters most commonly used to assess various chemodynamic properties in soil-water systems. Typically offered spring semester of even years.

AGRY 54500 Remote Sensing of Land Resources Sem. 1. Class 2, lab. 2, cr. 3. Prerequisite: AGRY 10500, and 25500 or 27000.

Application of remote sensing and spatial databases for observing and managing land resources within the Earth system; analysis and interpretation of remotely sensed data in combination with field observations and other data sources; conceptualization and design of a global earth resources information system.

AGRY 54800 Remote Sensing Seminar Sem. 1, Class 1, cr. 1.

Weekly seminar with invited speakers, which focuses on current research and applications of remote sensing science and technology. Conducted as a video teleconference seminar with participation by multiple universities and government. Required oral presentation by all students at the end of the semester.

AGRY 54900 Earth Observation Seminar Sem. 2, Class 1, cr. 1.

Weekly video teleconference seminar for the joint Earth Observation Program between Purdue and Katholieke Universiteit of Leuven, Belgium. Presentations by invited speakers, faculty, and students in the Earth Observation Program on topics in remote sensing observation, data analysis, modeling, and applications. Required oral presentation by all students at the end of the semester.

AGRY 55000 Field Crops Breeding Techniques SS. Lab. 4, cr. 2. Prerequisite: AGRY 52000.

Field nursery experience, including crossing procedures, plant evaluation, selection for pest resistance and for agronomic characters, and field data evaluation.

AGRY 55200 Advanced Statistics for Experimental Research Sem. 2. Class 3, lab. 2, cr. 4. Prerequisite: STAT 50300 or equivalent.

Completely randomized, randomized complete-block, and Latin-square designs; additional study of methods of mean separation, linear regression, and linear correlation; multiple and partial regression and correlation, factorial experiments; split-plot designs; analysis of covariance; unequal subclass numbers. Analysis of data by use of general statistical computer programs.

AGRY 55300 Introduction to SAS for Statistical Analysis Sem. 1. SS. Class 1, cr. 1.

Introduction to SAS as a programming language for students with no prior exposure to programming languages. Basics of programming languages, SAS concepts, data input and manipulation. Introduction to SAS for graphs, univariate statistics, simple statistics for classification data, analysis of variance, simple and multiple regression.

AGRY 55500 Soil and Plant Analysis Sem. 2. Class 1, lab. 6, cr. 3. Prerequisite: a quantitative chemistry course.

Principles and methods of chemical analysis of plants and soils. Topics include soil carbon analysis, exchangeable cations, soil acidity, salinity, pesticide analysis, and elemental analysis of plant tissue. Quantitative gravimetric and volumetric techniques are reviewed, followed by use of instrumental methods of analysis including atomic absorption, UV/Visible spectrometry, HPLC, and gas chromatography. Laboratory safety, quality assurance/quality control, and data reporting are emphasized.

AGRY 56000 Soil Physics Sem. 1. Class 2, lab. 3, cr. 3. Prerequisite: AGRY 25500 or 27000, and introductory physics.

Fundamentals of soil physics; transport of chemicals, heat, and gases; field spatial variability; principles and methods of physical analysis of soils; the influence of soil physical processes on environmental quality and agricultural production.

AGRY 56500 Soil Classification, Genesis, and Survey* Sem. 1. Class 2, lab. 3, cr. 3. Prerequisite: AGRY 25500 and EAS 11100.

The soil as a natural body, its characteristics and processes of formation; principal soils of Indiana; their adaptations, limitations, productivities, and uses; soil survey methods and airphoto interpretation of soil patterns.

AGRY 57000 Agronomy in International Development* Sem. 1. Class 2, lab. 2, cr. 3. Prerequisite: AGRY 10500 and 25500.

Integration of agronomic and related disciplines for diagnosing and solving constraints to food, feed, and fiber crop production; adaptation of academic agronomic sciences to research, teaching, and extension in the international context.

AGRY 57200 Molecular Cytogenetics Sem. 2. Class 2, cr. 2. Prerequisite: AGRY 32000. Offered in odd-numbered years.

Principles of chromosome biology: behavior of chromosomes at meiosis and mitosis, polyploidy, haploidy, aneuploidy, chromosome rearrangements, chromosome structure and evolution, chromatin organization and regulation of gene activity, chromosome engineering and genome architecture, application of molecular techniques to chromosome biology.

AGRY 57300 Molecular Cytogenetics Sem. 2. Lab. 2, cr. 1. Prerequisite: AGRY 32000. Offered in odd-numbered years.

Application of principles from molecular cytogenetics. Lab consists of chromosome preparation from mitotic/meiotic samples, identification of meiotic stages, chromosome banding, fluorescence *in situ* hybridization and preparation of dipteran polytene chromosomes. Students are encouraged to bring samples from their own thesis research to use as test samples for molecular analysis.

AGRY 57500 Soil and Nutrient Management Sem. 1. Class 3, cr. 3. Prerequisite: AGRY 25500 or 27000. Offered in odd-numbered years.

Emphasis is on using soils information in the development of sustainable, agronomically effective and environmentally benign crop systems, especially as relates to plant nutrients. Topics discussed include soil properties affecting crop production and nutrient cycling; soil testing; making fertilizer recommendations; fertilizer application technology including variable rate technology; nutrient monitoring technologies; utilizing animal wastes and co-products; interactions of soil management and crop production practices with nutrient efficiency.

AGRY 58000 Soil Microbiology Sem. 2. Class 3, cr. 3. Prerequisite: AGRY 25500, BCHM 30700, and BIOL 22100.

The soil microbial population and its role in the soil ecosystem; microbial transformations of inorganic and organic compounds; decomposition of residues; dynamics of soil organic matter.

AGRY 58100 Soil Microbiology Laboratory Sem. 2. Lab. 6, cr. 2. Prerequisite or corequisite: AGRY 58000.

Laboratory study of microbial populations, residue decomposition, nitrogen transformations, and enzyme activities in soils.

AGRY 58200 Environmental Fate of Pesticides Sem. 2. Class 3, cr. 3.

Emphasis is given to developing a fundamental understanding of the processes controlling the fate of organic chemicals, such as pesticides, in the environment. Processes considered include: volatilization, degradation, leaching, and sorption.

AGRY 58500 Soils and Land Use (NRES 58500) Sem. 2. Class 2, lab. 3, cr. 3. Prerequisite: a soils course or a geology course.

Soils as a resource in development planning; soil properties affecting land use; use of soil survey, aerial photos, topographic maps, and other resource data in land-use allocation; nonengineering aspects of site selection for various land uses, water conservation, waste disposal, and erosion control.

AGRY 59600 Professional Presentations Sem. 1. Class 1, cr. 1. (el. 7).

Develop confidence and skills in preparing and delivering professional presentations to both peer scientific and student audiences.

AGRY 59700 Communicating With The Public Sem. 2. Class 1, cr. 1. (el. 7). Prerequisite: AGRY 59600, or consent of instructor. Offered in odd-numbered years.

This course will prepare students being trained as agronomy professionals to enhance their communication skills so they can successfully interact with the public.

AGRY 59800 Special Problems Sem. 1 and 2. SS. Cr. 1–6.

Research on agronomic problems conducted in laboratory, field, or library; report required. Arrange with agronomy staff member before registering.

Animal Sciences

Undergraduate Level/Lower-Division Courses

ANSC 10100 Animal Agriculture Sem. 1 and 2. SS. Class 3, cr. 3 (el. 1 to 2 A).

Importance of livestock in the field of agriculture, and the place of meats and other animal products in the human diet. Course not available for students enrolled on West Lafayette campus. Credit cannot be obtained for both ANSC 10100 and ANSC 10200. Offered at regional campuses, Vincennes University and other distance education sites.

ANSC 10200 Introduction to Animal Agriculture Sem. 1 and 2. Class 2, lab. 2, cr. 3. Freshman, sophomore or junior classification.

A study of animal agriculture emphasizing the efficient production of animal food products from poultry, dairy, and meat animals. Credit cannot be obtained for both ANSC 10100 and ANSC 10200.

ANSC 10600 Biology of Companion Animal Sem. 2. Class 3, cr. 3.

Introduction to the various aspects of companion animal biology. Topics include anatomy, physiology, health, immunity, nutrition, growth, digestion, metabolism, behavior, genetics, reproduction, and lactation. Of ANSC 10100, 10200, and 10600, only one course can be used as an animal sciences elective.

ANSC 18100 Orientation to Animal Sciences* Sem. 2. Class 2, cr. 1.

Introduction to the faculty, programs, opportunities, career preparation, and personal development requirements needed to succeed in a career in the animal industries. Course meets during weeks 1–8.

ANSC 20100 Functional Anatomy and Animal Performance Sem. 1. Class 2, lab. 2, cr. 3 (el. 3 A).

A course designed to observe the norms for acceptable conformation of breeds of farm animals and to relate significant characteristics of farm animals to performance and profitability.

ANSC 22100 Principles of Animal Nutrition Sem. 1 and 2. SS. Class 3, cr. 3 (el. 3 to 6 A). Prerequisite: CHM 11100 or CHM 11500 and sophomore standing or junior standing or senior standing.

Classification and function of nutrients, deficiency symptoms, digestive processes, characterization of feedstuffs, and formulation of diets for domestic animals.

ANSC 23000 Physiology of Domestic Animals Sem. 1 and 2. Class 4, cr. 4 (el. 3 or 4 A). Prerequisite: BIOL 11000 or BIOL 11100.

A lecture course designed to present physiology of domestic farm animals. Function of tissues and organs, maintenance of internal steady-state conditions, and body responses to external environmental conditions will be presented. Physiological mechanisms involved in lactation, growth, and reproduction will be included.

ANSC 24500 Applied Animal Management Sem. 1 and 2. Class 1, lab. 3, cr. 2 (el. 3 or 4 A).

Skills and practices related to handling and care of beef and dairy cattle, horses, poultry, sheep, and swine.

ANSC 28100 Career Planning in Animal Sciences Sem. 1. Class 1, cr. 1 (el. 3 A).

A seminar course designed to inform students of the career opportunities in animal industries, develop their interviewing and other interpersonal skills, and begin to plan the course of study, work experiences, and marketing methods needed to obtain a successful internship and employment.

ANSC 29200 Special Assignments Sem. 1 and 2. SS. Cr. 0 (el. 3 or 4 A).

Reading, discussions, written reports, seminar presentations, teaching, field or laboratory experiences provided for enrichment in special areas of animal science. To be arranged with individual staff members prior to registration. Approval of the department head required.

ANSC 29300 Special Assignments Sem. 1 and 2. SS. Cr. 1–3 (el. 3 or 4 A).

Reading, discussions, written reports, seminar presentations, teaching, field or laboratory experiences provided for enrichment in special areas of animal science. To be arranged with individual staff members prior to registration. Approval of the department head required. Combination of ANSC 29300 and 49300 cannot exceed six credits. Pass/No Pass grading option only.

ANSC 29400 Exploring International Animal Agriculture SS. Cr. 3.

An experiential learning class. Interrelationship of animal agriculture with agronomic production, food industries, culture, national infrastructure, political systems, and international trade will be investigated through international travel. Critical thinking and communications skills will be enhanced by topic leadership, comparative analysis, and seminar presentations. May be repeated for credit with variable title.

ANSC 29500 Special Topics in Animal Sciences Sem. 1 and 2. SS. Cr. 0–3.

Lecture presentation of specialized material not available in formal courses of the department. The specific topic that is offered will be indicated on the student's record. May be repeated for credit.

Undergraduate Level/Upper-Division Courses

ANSC 30100 Animal Growth, Development, and Evaluation Sem. 1. Class 2, lab. 4, cr. 4 (el. 5 or 7 A).

A study of meat animal growth and developmental processes, including micro and gross anatomy, and factors that affect body/carcass composition with application to animal and carcass evaluation.

ANSC 30300 Animal Behavior Sem. 2. Class 2, lab. 2, cr. 3 (el. 4 or 6 A).

Discussion of animal behavior with emphasis on developing an understanding of the reasons domesticated animals react the way they do toward their kind and to humans. The laboratory will be used for observation of behavior patterns in animals. Solutions for unusual behavior include behavior modification techniques.

ANSC 31100 Animal Breeding Sem. 1 and 2. Class 3, lab. 2, cr. 4 (el. 5 to 8 A). Prerequisite: (AGRY 32000 or BIOL 28000) and (STAT 30100 or STAT 50300).

Genetic principles and their applications in improvement of production efficiency in livestock.

ANSC 32400 Applied Animal Nutrition* Sem. 2. Class 2, lab. 2, cr. 3 (el. 6 or 8 A). Prerequisite: ANSC 22100.

Application of the principles of animal nutrition to the formulation and feeding of supplements and complete rations for animals; ration ingredients and substitution values; computer applications; legal aspects of feed formulation; and industry practices.

ANSC 33200 Environmental Physiology of Domestic Animals Sem. 2. Class 2, cr. 2 (el. 4 or 6 A). Prerequisite: ANSC 23000.

Interactions of environmental factors with physiological processes in domestic animals.

ANSC 33300 Physiology of Reproduction Sem. 1 and 2. Class 3, cr. 3 (el. 5 to 8 A). Prerequisite: ANSC 23000 or (BIOL 20300 and BIOL 20400).

Basic information on the physiological processes of reproduction.

ANSC 33400 Physiology of Reproduction Laboratory Sem. 2. Lab. 2, cr. 1 (el. 6 or 8 A). Prerequisite or corequisite: ANSC 33300.

Anatomical structures, physiological processes, and techniques concerned with animal reproduction.

ANSC 34500 Animal Health Management Sem. 1. Class 3, cr. 3. Prerequisite: ANSC 22100 and 23000.

The objectives of this course are to familiarize the student with disease processes and mechanisms. Management techniques in food, companion and research animal species that minimize or prevent disease will be emphasized, as well as the consequences on animal production, reproduction, and human health.

ANSC 35100 Meat Science Sem. 2. Class 3, cr. 3 (el. 4 or 6 A).

Study of muscle and meat, principles involved in the conversion of living animals to meat and by-products; efficient utilization of all types of meat as food.

ANSC 35101 Meat Science Laboratory Sem. 2. Lab. 2, cr. 1 (el. 4 or 6 A). Corequisite: ANSC 35100.

Application of scientific principles to the meat industry, with emphasis on all aspects of processing including: harvest; carcass grading and evaluation; fabrication; cured, smoked, and comminuted meat products; quality control; product development; and retail and food service merchandising.

ANSC 36800 Dairy Products* (FS 36800) Sem. 1. Class 2, lab. 2, cr. 3 (el. 5 or 7 A).

Scientific and technical aspects of procurement, processing, packaging, and quality control of fluid milk products and frozen dairy foods. Emphasis is placed on process unit operations.

ANSC 37000 Livestock Evaluation* Sem. 2. Lab. 6, cr. 2 (el. 4 or 6 A). Prerequisite: Junior Standing or Senior Standing.

This course is designed to develop logical thinking and speaking skills, while developing the ability to critically evaluate livestock in their production environments. Prior experience in public speaking or judging is not required. Combination of ANSC 37000, 37100, 37200, 47000, 47100, and 47200 cannot exceed three credits toward ANSC electives.

ANSC 37100 Dairy Evaluation* Sem. 2. Lab. 6, cr. 2 (el. 4 or 6 A). Prerequisite: Sophomore Standing or Junior Standing or Senior Standing.

This course will enable the student to become familiar with breeds of dairy, parts of dairy cattle and their relationship to function. Opportunities will exist to associate with people from various breed organizations within the dairy industry. Combination of ANSC 37000, 37100, 37200, 47000, 47100, and 47200 cannot exceed three credits toward ANSC electives.

ANSC 37200 Horse Evaluation* Sem. 2. Lab. 6, cr. 2 (el. 4 or 6 A). Prerequisite: Sophomore Standing or Junior Standing or Senior Standing.

A student-centered laboratory course designed to familiarize students with functional horse conformation and type that maximizes athletic ability, applies selection criteria established by national breed associations for evaluating performance events, and prepares students to select halter and performance horses of many breeds and disciplines. Combination of ANSC 37000, 37100, 37200, 47000, 47100, and 47200 cannot exceed three credits toward ANSC electives.

ANSC 38100 Animal Sciences Career Leadership Sem. 2. Class 3, cr. 3. Prerequisite: AGR 20100 or a course on the College of Agriculture Multicultural Awareness list, junior or senior classification.

An interactive, small group, discussion class covering effective interpersonal and group skills needed to enhance career satisfaction in a diverse workplace including building networks within industry, cross-cultural communication and gaining experiences in group problem-solving and decision making. This course may be used as an additional written communication elective as required in all plans of study in Animal Sciences.

ANSC 39000 Animal Sciences Internship Sem. 1 and 2. SS. Cr. 0 (el. 5 to 8 A). Prerequisite: Enrolled In Animal Agribusiness or Animal Production or Animal Products or Animal Science major.

Internships with producers, businesses, or agencies arranged in cooperation with faculty coordinator.

ANSC 39300 Animal Industry Travel Course* Sem. 2. Class 1, lab. 2, cr. 1–2 (el. 4-8 A). Prerequisite: consent of instructor required.

A classroom and travel course designed to expose students to animal production operations, agribusinesses, industry leaders, and their philosophies as well as critical contemporary issues throughout various geographical areas of the United States. Travel is conducted during spring break or summer sessions and includes visits to animal production farms, universities, and agribusinesses. Additional fee required. May be repeated for a maximum of three credits; limited to two credits toward animal sciences electives. Offered in odd-numbered years.

ANSC 40000 Animal Sciences Study Abroad Sem. 1 and 2. SS. Credit 0–8.

Utilized to record credits earned through participation in Purdue study abroad programs with cooperating foreign universities. May be repeated for credit.

ANSC 40400 Animal Welfare* Sem. 1. Class 2, lab. 2, cr. 3 (el. 5 or 7 A). Prerequisite: Senior Standing.

A multi-disciplinary course that introduces students to the fields of animal welfare and the ethics of animal use. The course will emphasize farm animal welfare and production issues.

ANSC 43500 Reproductive Management of Farm Animals Sem. 1. Class 2, lab. 3, cr. 3 (el. 5 or 7 A). Prerequisite: ANSC 33300.

Management practices associated with improved reproductive efficiency. Procedures for diagnosis of reproductive failure and practical methods of controlling reproduction will be identified.

ANSC 44000 Horse Management Sem. 1. Class 2, lab. 2, cr. 3 (el. 5 or 7 A). Prerequisite: ANSC 22100 and Senior Standing.

Current breeding, feeding, housing, selection, disease control, and other management practices essential for sound economic planning of horse operations in today's horse industry. Laboratory farm visits provide students with real application examples and industry contacts.

ANSC 44100 Beef Management Sem. 1. Class 2, lab. 2, cr. 3 (el. 7 A). Prerequisite: ANSC 22100 and Senior Standing.

Breeding, feeding, and management practices essential for economical beef production, including performance testing.

ANSC 44200 Sheep Management Sem. 2. Class 2, lab. 2, cr. 3 (el. 8 A). Prerequisite: ANSC 22100 and Senior Standing.

Breeding, feeding, and management practices essential for economical sheep production and commercial lamb feeding, including performance testing.

ANSC 44300 Swine Management Sem. 2. Class 2, lab. 2, cr. 3 (el. 8 A). Prerequisite: ANSC 22100 and Senior Standing.

Breeding, feeding, and management practices essential for commercial swine production, including performance testing.

ANSC 44400 Dairy Management* Sem. 2. Class 2, lab. 2, cr. 3 (el. 8 A). Prerequisite: ANSC 22100 and Senior Standing.

Current breeding, feeding, physiology, disease prevention, and management practices essential for economical milk production.

ANSC 44500 Commercial Poultry Management Sem. 2. Class 2, lab. 2, cr. 3 (el. 8 A). Prerequisite: ANSC 22100 and Senior Standing.

Current developments and practices in the commercial production of eggs, broilers, and turkeys; principles of breeding, physiology, nutrition, management, and disease prevention.

ANSC 44600 Companion Animal Management Sem. 1. Class 2, lab. 2, cr. 3 (el. 5 or 7 A). Prerequisite: ANSC 22100 and Senior Standing.

This course details understanding of the economic scope of the pet industry as well as the role of pets in American society. The students will acquire the information to be responsible pet owners by expanding their knowledge of housing practices, nutritional care, health care, behavior and breeding of companion animals.

ANSC 47000 Livestock Judging* Sem. 1. Lab. 3, cr. 1 (el. 5 or 7 A). Prerequisite: ANSC 37000.

This course is designed to teach livestock evaluation, relationship of production data to live animal evaluation characteristics, expand logical thinking and reasoning skills, and enhance oral communication skills.

ANSC 47100 Dairy Judging* Sem. 1. Lab. 3, cr. 1 (el. 5 or 7A). Prerequisite: ANSC 37100.

Opportunities will exist to allow the student to practice analysis and enhance decision-making processes in placing animals in collegiate dairy contests. Communication skills will be developed to properly present and defend those decisions with confidence.

ANSC 47200 Horse Judging* Sem. 1. Lab. 3, cr. 1 (el. 5 or 7 A). Prerequisite: ANSC 37200.

An intensive capstone experience for those students wishing to apply their knowledge of functional horse conformation, athletic ability, selection criteria established by national breed associations, and develop advanced decision making, communication, and experience working within a team environment by preparing and competing in national judging contests.

ANSC 48100 Contemporary Issues in Animal Sciences I Sem. 1. Class 1, cr. 1. Prerequisite: Junior or Senior Standing.

Industry-led and student-led discussions and debate of current issues facing animal industries Topics include environmental impact, food safety, animal care and well-being, ethics, use of biotechnology, world food supply, and international agricultural trade. Industry representatives will share their experiences of the importance of good communication skills as well as technical knowledge of issues that are of concern to animal industries. Students will share their experiences with each other from course work, internships, research problems, study abroad and club activities as they address contemporary issues facing animal industries.

ANSC 48500 Dairy Farm Evaluation Sem. 2. Class 1, lab 2, cr. 2. Prerequisite: ANSC 44400; junior or senior standing.

This course will provide students with an opportunity to integrate and apply knowledge of dairy cattle management systems, nutrition, reproduction, genetics, milk quality, animal handling, physical farm facilities, manure handling and management, personnel and their financial implications. Students will develop critical analysis skills and apply troubleshooting principles in the identification and resolution of dairy farm management issues in a learning environment that is structured around farm evaluation field trips and case studies.

ANSC 49100 Special Problems Sem. 1 and 2. SS. Cr. 1–3 (el. 5 to 8 A).

Supervised individual laboratory or library assignments. Written reports required. To be arranged with individual staff members prior to registration. Requires approval of department head. May be repeated for a maximum of six credits with approval of department head.

ANSC 49200 Special Assignments Sem. 1 and 2. SS. Cr. 0 (el. 5 to 8 A).

Reading, discussions, written reports, seminar presentations, teaching, field or laboratory experiences provided for enrichment in special areas of animal science. To be arranged with individual staff members prior to registration. Approval of department head required.

ANSC 49300 Special Assignments Sem. 1 and 2. SS. Cr. 1–3 (el. 5 to 8 A).

Reading, discussions, written reports, seminar presentations, teaching, field or laboratory experiences provided for enrichment in special areas of animal science. To be arranged with individual staff members prior to registration. Approval of department head required. Combination of ANSC 29300 and 49300 cannot exceed six credits. Pass/No Pass grading option only.

ANSC 49500 Special Topics in Animal Sciences Sem. 1 and 2. SS. Cr. 0–3.

Lecture presentation of specialized material not available in the formal courses of the department. The specific topic that is offered will be indicated on the student's record. Approval of department head required. May be repeated for credit.

ANSC 49900 Thesis Research Sem. 1 and 2. SS. Cr. 1–6. Prerequisite: admission to honors program. May be repeated for credit.

For students doing specialized animal sciences research; report required. Arrange with academic advisor and honors research coordinator before registering.

Dual Level/Undergraduate-Graduate

ANSC 51100 Population Genetics (AGRY 51100, FNR 51100) Sem. 1. Class 3, cr. 3. Prerequisite: AGRY 32000; corequisite: STAT 50300 or 51100.

Basic concepts of population genetics. Characterization of populations using gene frequencies, gametic and zygotic disequilibrium; forces changing gene frequencies (mutation, migration, selection, and random gene drift) and genotypic frequencies (mating systems: inbreeding, crossbreeding, and phenotypic assortative) and related hypothesis testing; gene trees and the coalescent process; molecular phylogenies.

ANSC 51300 Design of Breeding Programs Sem. 2. Class 3, cr. 3. Prerequisite: ANSC 31100 and STAT 50300.

Integration of principles of animal breeding and genetics into animal improvement programs. Emphasis is placed on the interaction among genetics, nutrition, and physiology.

ANSC 51400 Animal Biotechnology Sem. 1. Class 3, cr. 3. Prerequisite: AGRY 32000 or BIOL 28000, and BCHM 30700.

Presentation and discussion of the history, developments, and applications of molecular genetic analysis of human and animal genomes, and the use of gene transfer in research, animal agriculture, and human medicine. Ethical and economical ramifications of biotechnology in society will be introduced through reading assignments and discussion.

ANSC 52200 Monogastric Nutrition Sem. 1. Class 3, cr. 3. Prerequisite: ANSC 22100 and BCHM 30700.

Digestion and absorption, nutrient utilization, and interrelationships in poultry, swine, and other monogastric animals.

ANSC 52400 Ruminant Nutrition and Physiology Sem. 2. Class 3, cr. 3. Prerequisite: ANSC 22100 and BCHM 30700.

Physiological, microbiological, and biochemical aspects of digestion and metabolism in the ruminant animal.

ANSC 53400 Advanced Reproductive Physiology Sem. 2. Class 3, cr. 3. Prerequisite: ANSC 33300.

A study of mechanisms that interact to control reproduction in farm animals. Current scientific literature and hypotheses are presented, and potential methods to enhance reproductive efficiency are examined.

ANSC 53500 Avian Physiology (BMS 528) Sem. 2. Class 2, cr. 2. Prerequisite: ANSC 23000 or BMS 30000, or equivalent.

A study of the basic principles of physiology and functional anatomy of birds. Topics include the following systems: muscular, nervous, cardiovascular, respiratory, digestive, lymphoid, endocrine, and reproductive.

ANSC 53600 The Digestive System in Health and Disease Sem. 2. Class 2, cr. 2. Prerequisite: BCHM 56100. Offered in odd-numbered years.

Comparative study of the physiology of the gastrointestinal tract focused on the importance of, and interactions between, gut physiology, gut associated immune system and intestinal microorganisms in relation to health and disease.

ANSC 55100 Muscle Development, Physiology, and Chemistry Sem. 2. Class 3, cr. 3. Prerequisite: ANSC 23000, 30100, or 35100, and BCHM 30700. Offered in even-numbered years.

The chemical and physical properties of muscle, including growth and development, ultrastructure, contraction, energy metabolism, and transformation to meat.

ANSC 55500 Mechanisms of Animal Growth and Development Sem. 2. Class 3, cr. 3 (el. 6 or 8 A). Prerequisite: BCHM 30700 and ANSC 30100 or BIOL 27000.

A study of the molecular and cellular processes controlling embryonic development and growth of domesticated animals. Includes discussions of current research concerning molecular mechanisms of fertilization, egg activation, and early development and endocrine factors controlling cell growth, differentiation and tissue formation, and turnover. Experimental approaches utilized for developmental and growth biology research are discussed.

ANSC 59500 Special Topics in Animal Sciences Sem. 1 and 2. SS. Cr. 0–3. Approval of department head required. May be repeated for credit.

Lecture presentation of specialized material not available in the formal courses of the department. The specific topic that is offered is indicated on the student's record.

Biochemistry

Undergraduate Level/Lower-Division Courses

BCHM 10000 Introduction to Biochemistry Sem. 1. Class 2, cr. 2.

A survey of modern biochemistry using case studies that highlight general theories and unifying concepts. This course is open to all students and does not require any college science courses as background or prerequisite.

BCHM 22100 Analytical Biochemistry Sem. 1 and 2. Class 2, lab. 3, cr. 3. Prerequisite: CHM 11600

Discussion of qualitative and quantitative analysis of biological compounds including pH measurement and control, spectrophotometry, measurement of radioactivity; theoretical basis of various separation techniques, including chromatography and electrophoresis; application of these methods to separation and analysis of biological compounds. Laboratory sessions will provide practical experience in the use of these methods. This course is designed for biochemistry majors.

BCHM 29000 Experimental Design Seminar Sem. 2, Class 1, Cr. 1.

Introduction to fundamentals of scientific principles and practice in biochemistry. Students will learn how to develop hypotheses, design experiments, and critically analyze results to create new knowledge. Intended for sophomores. Restricted to Biochemistry majors.

Undergraduate Level/Upper-Division Courses

BCHM 30700 Biochemistry Sem. 1 and 2. Class 3, cr. 3. Prerequisite: CHM 25600 or CHM 25700 or CHM 26200.

Introduction to the chemistry, function, and metabolism of compounds found in the living organism.

BCHM 30900 Biochemistry Laboratory Sem. 1 and 2. Lab. 3, cr. 1. Corequisite: BCHM 30700.

Experiments that introduce methods for analysis and separation of biological molecules and that illustrate the biochemical and metabolic concepts covered in BCHM 30700.

BCHM 32200 Analytical Biochemistry Sem. 1 and 2. Class 1, lab. 3, cr. 2. Prerequisite: BCHM 22100.

Modern biochemical methods are used to isolate, analyze, and study the properties of a great variety of materials, such as amino acids; proteins, including several enzymes; monosaccharides, oligosaccharides, and polysaccharides; fats; and nucleic acids. Emphasis is on experimentation. The course is designed for biochemistry majors.

BCHM 36100 Molecules Sem. 2. Class 3, Cr. 3. Prerequisite: CHM 26100 or CHM 25500 and concurrent enrollment in CHM 26200 or CHM 25600.

A lecture course that relates biochemistry to organic chemistry. Chemical principles relevant to the assembly and function of macromolecules, the logic of biological free energy conversion, and enzyme catalysis are emphasized, all of which provide foundation for the study of metabolism.

BCHM 39000 Professional Development Seminar Sem. 1. Class 1, Cr. 1.

The objective of this course is to help biochemistry students with professional development and career planning. Students will learn about career possibilities, interview skills, job search strategies, graduate and professional school applications, resume construction and industrial practices. Intended for juniors. Restricted to Biochemistry majors.

BCHM 40000 Biochemistry Study Abroad Sem. 1 and 2. SS. Credit 0–8. May be repeated for credit.

Utilized to record credits earned through participation in Purdue study abroad programs with cooperating foreign universities.

BCHM 46200 Metabolism Sem. 1. Class 3, cr. 3. Prerequisite: BCHM 36100.

A lecture course to provide students with a broad and thorough understanding of core metabolic pathways and how they are regulated. Anabolic and catabolic processes of metabolic pathways will be studied at the biochemical, structural, genetic and molecular levels. Students will learn to appreciate how the various metabolic pathways are integrated and how the fundamental metabolic pathways relate to medicine, agriculture and human disease.

BCHM 46300 Macromolecular Machines Sem. 1. Class 3, cr. 3. Prerequisite: BCHM 46200.

A tour of the cell from the perspective of the macromolecules. This course examines how the three-dimensional structures of biological molecules confer cellular function.

BCHM 46500 Biochemistry of Life Processes Sem. 2. Class 2, cr. 2. Prerequisite: BCHM 46300.

Major questions in biochemistry and contemporary approaches to these problems. Materials covered in class will primarily be derived from primary literature. Students will continue to develop the skills needed to critically read, evaluate, and assimilate the primary scientific literature. Restricted to Biochemistry majors.

BCHM 49000 Undergraduate Seminar Sem. 2. Class 1, cr. 1. Prerequisite: BCHM 49800, or BCHM 49900, or BCHM 57200

Discussion of individual student's research projects performed in BCHM 49800, BCHM 49900, or BCHM 57200. Preparation of posters and public seminars based upon research results obtained in BCHM 49800, BCHM 49900, or BCHM 57200.

BCHM 49500 Special Assignments Sem. 1 and 2. SS. Lab. 3 to 9, cr. 1–3. Prerequisite: must be approved by appropriate instructor before registration.

Special work in biochemistry not included in other courses.

BCHM 49800 Undergraduate Thesis Sem. 1 and 2. SS. Cr. 1–6. Prerequisite: must be approved by appropriate instructor before registration. May be repeated for credit.

Supervised individual research.

BCHM 49900 Thesis Sem. 1 and 2. SS. Cr. 1–6. Prerequisite: admission to honors program. May be repeated for credit.

For honors students doing individualized research on biochemical problems. Arrange with honors programs coordinator before registering.

Dual Level/Undergraduate-Graduate

BCHM 56100 General Biochemistry I Sem. 1, Class 3, cr. 3. Prerequisite: CHM 25600 or CHM 26200 or CHM 25700 or MCMP 20500.

This course will provide undergraduate and graduate students with basic understanding of biochemical and structural properties of amino acids, nucleic acids, lipids and carbohydrates. This course will allow students to connect the relationship between structure and function of biomolecules. In addition, students will learn to understand enzyme properties, enzyme mechanism of action and enzyme regulation.

BCHM 56200 General Biochemistry II Sem. 2, Class 3, cr. 3. Prerequisite: CHM 25600 or CHM 26200 or CHM 25700 or MCMP 20500.

This course will provide undergraduate and graduate students with an understanding of core metabolic pathways. Anabolic and catabolic processes of metabolic pathways will be studied. Biochemical and structural knowledge will be used to determine how enzymes and coenzymes are needed to regulate and control metabolic pathways.

BCHM 57200 Advanced Biochemical Techniques Sem. 1. Lab. 9, cr. 3. Prerequisite: BCHM 32200 or equivalent; corequisite: BCHM 56200.

Modern techniques for the isolation, purification, and characterization of biological macromolecules. Advanced techniques of protein and nucleic acid chemistry. Emphasis will be placed on recombinant DNA technology, including the isolation, cloning, and characterization of genes. Specific projects will be designed to meet individual student interests. Students are strongly encouraged to consult with the instructor before registering for the course.

BCHM 59300 Chemistry of Metabolism Sem. 1. Class 1, cr. 1. Prerequisite: organic chemistry and BCHM 56200 or equivalent.

The course objective is to provide beginning graduate students with an understanding of the organic chemical basis of metabolic transformations. Pathways will not be emphasized, but the chemical principles that govern some of the reactions will be. Special emphasis will be placed on carbon-carbon bond formation, nitrogen insertion, and the formation of structures with aromatic rings.

Botany and Plant Pathology

Undergraduate Level/Lower-Division Courses

BTNY 20100 Plants and Civilization Sem. 2. Class 3, cr. 3.

This course, intended primarily for non-majors, covers the history of agriculture, with focus on the centers of origin of our major food, fiber, and medicinal plants, and their historical, cultural, and economic relevance. The course also surveys the biology of crop plants, with respect to taxonomy, anatomy, cell structure, physiology, development, and genetics. Discussions also center on the roles plant biotechnology may play in sustainable agriculture and in helping to alleviate problems caused by overpopulation and ecological stress.

BTNY 20400 Crop and Weed Identification (AGRY 20400) Sem. 2. Lab. 4, cr. 1 or 2.

The identification by sight of plant mounts and seeds of over 200 crops and weeds is taught. The first eight weeks, which covers restricted weeds, prohibited noxious weeds, common weeds, and seed diseases, can be taken for one credit; the last eight weeks covers cereals, grass and legume forages, and legume crops. The list of species to be studied for two credits is obtained from the Intercollegiate Crops Judging Manual. The species to be covered for one credit include the above-listed weeds and additional weed specimens pertinent to the weeds contest. The use and origins of the species are discussed briefly. Suggested course in preparation for AGRY 30500 Seed Analysis and Grain Grading.

BTNY 20700 The Microbial World Sem. 2. Class 2, lab 2. cr. 3.

The overall goal of this course is to engender an appreciation of microorganisms through discussions of their role in food production, agriculture, and history. We will consider events, foods, processes, anecdotes, origins, and our own experiences and discuss how microbes affect human endeavors. Concepts relevant to the biology of microorganisms will be emphasized. Classroom demonstrations and visual aids will be an integral part of the course. This course has been designed as an introductory, general interest class on the biology of microorganisms.

BTNY 21000 Introduction to Plant Science Sem. 1 and 2. Class 3, lab. 2, cr. 4.

An introduction to the major groups in the plant kingdom, their origin, classification, and economic importance. The areas of anatomy, morphology, cytology, physiology, biochemistry, molecular biology, genetics, and ecology will be explored as they relate to plant sciences and agriculture. Course may also be offered for dual credit with cooperating Indiana high schools upon documented approval by the Department of Botany and Plant Pathology.

BTNY 21100 Plants and the Environment Sem. 2. Class 3, cr. 3. Prerequisite: BTNY 21000.

Plants are essential to environmental and human health, and the issues related to these interactions have received much public attention. This course provides the scientific basis for issues-related topics such as the impacts of plants on biodiversity; how plants affect and are affected by global climate changes and pollution; the roles of plants as invasive species; ways in which plants can help solve environmental problems; and the consequences of human manipulation of plants (e.g. genetic engineering, bioremediation) on plant communities and ecosystems.

Undergraduate Level/Upper-Division Courses

BTNY 30100 Introductory Plant Pathology Sem. 1 and 2. Class 2, lab. 2, cr. 3 (el. 3 to 8 A, S). Prerequisite: BTNY 21000.

Basic principles of plant pathology, including etiology, symptomatology, control, and epidemiology of representative diseases of plants.

BTNY 30200 Plant Ecology Sem. 2. Class 2, lab. 2, cr. 3. Prerequisite: BIOL 11000 or BIOL 11100 or BTNY 21000.

This course will provide an introduction to the broad field of plant ecology. Through lectures and lab assignments, students will gain an in-depth understanding of ecological concepts regarding the occurrence and distribution of plant species and populations. Students will also gain insight into the application of these concepts to the conservation and management of plant species and populations. Offered in odd-numbered years.

BTNY 30400 Introductory Weed Science Sem. 2. Class 2, lab. 2, cr. 3. Prerequisite: BIOL 11000 or BIOL 11100 or BTNY 21000.

A survey of the scientific principles underlying weed control practices; emphasis is on the ecology of weeds and control in crop associations. It is recommended that this course be followed by BTNY 50400.

BTNY 30500 Fundamentals of Plant Classification* Sem. 1. Class 2, lab. 2, cr. 3. Prerequisite: BIOL 11000 or BIOL 11100 or BTNY 21000.

The principles of classification of seed plants, with emphasis on methods of identification in laboratory and field.

BTNY 31600 Plant Anatomy Sem. 1. Class 2, lab. 4, cr. 4. Prerequisite: BTNY 21000.

The internal structure of seed plants. Description and recognition of cell and tissue types, tissue systems, and their interrelations in vegetative and reproductive structures. Developmental changes of the plant body from embryo to mature plant and from meristems to mature tissues. Experimental approaches where relevant to structure-function relationships and to development will be introduced.

BTNY 35000 Biotechnology in Agriculture Sem. 2. Class 3, cr. 3. Prerequisite: BIOL 11000 or BTNY 21000 or (BIOL 13100 and BIOL 13200). Authorized equivalent courses or consent of instructor may be used in satisfying course pre- and corequisites.

A study of the methods used to produce genetically modified organisms, primarily using gene transfer technology, and the application of these organisms in agriculture. The uses of microbes, plants, and animals in agricultural biotechnology are examined. Social, economic, and ethical issues related to biotechnology are discussed.

BTNY 38000 Field Crop Diagnostic Techniques (AGRY 38000, ENTM 38000) SS. Class 1, cr. 1. Prerequisite: introductory courses in soil science, crop production, entomology, weed science, and plant pathology.

Identification of field crop problems via in-field diagnostic techniques, determination of the magnitude of problems utilizing in-field thresholds, evaluation of optional multidisciplinary management strategies, and development of appropriate strategies based upon economic, environmental, and cultural concepts.

BTNY 39000 Selected Topics in Plant Science Sem.1 and 2. SS. Cr. 1–3. Prerequisite: BIL 11000 or BIOL 11100 or BIOL 12100 or BIOL 13100 or BIOL 20300 or BIOL 20400 or BIOL 27000 or BTNY 21000.x

This course deals with special topics in botany not covered in regular undergraduate coursework. Credit depends upon work done. Offered in odd-numbered years.

BTNY 40000 Botany and Plant Pathology Study Abroad Sem. 1 and 2. SS. Credit 0–8. May be repeated for credit.

Utilized to record credits earned through participation in Purdue study abroad programs with cooperating foreign universities.

BTNY 42000 Plant Cellular and Developmental Biology Sem. 2. Class 3, cr. 3.

This course will focus on the fundamentals of plant cellular and developmental biology. Topics to be covered include: the structure and function of plant organelles and membranes; the cell cycle; DNA, RNA and protein synthesis; the secretory pathway, and the cellular basis of development and whole plant morphogenesis.

BTNY 44300 Arthropods and Diseases of Turfgrass (ENTM 44300) Sem. 2. Class 3, cr. 3. Prerequisite: BTNY 30100.

This course is designed to introduce students to the biology, ecology, and management of arthropods and diseases associated with turfgrass ecosystems. The course is divided into two discrete segments with a focus on arthropods during the first half of the semester and diseases during the second half of the semester.

BTNY 44600 Integrated Plant Health Management For ornamental Plants (ENTM 44600) Sem. 1. Class 2, lab 3, cr. 3. Prerequisite: BTNY 30100 and ENTM 20600 or 20700.

Principles and practices for diagnosing and managing diseases, insects, and abiotic disorders of woody and herbaceous ornamental plants and turf. Designed for those students in urban forestry, horticulture, and turf management who want a one-semester course on integrated plant health management.

BTNY 49700 Undergraduate Seminar Sem. 2. Class 1, cr. 1. Prerequisite: BTNY 49800.

Problem-based seminar drawing on students' experience in undergraduate research. Preparation of seminar and poster presentations based on problem analysis relevant to careers in plant biology, environmental plant science, and crop protection. Instruction on problem analysis, scientific writing, and presentation skill are combined with career development activities, including invited speakers from industry, academia, and government. With prior approval and in consultation with the instructor, a student may substitute a problem based on study abroad, an undergraduate course project, or supervised internship or other supervised work-related experience.

BTNY 49800 Research in Plant Science Sem. 1 and 2. SS. Cr. 1–3. Prerequisite: approval by collaborating instructor. May be repeated once for credit.

Supervised individual laboratory or field research. A written report of work accomplished will be required.

BTNY 49900 Thesis Research Sem. 1 and 2. SS. Cr. 1–6. Prerequisite: admission to the honors program. May be repeated for credit.

Supervised individual research.

Dual Level/Undergraduate-Graduate

BTNY 50400 Advanced Weed Science Sem. 1. Class 3, cr. 3. Prerequisite: BTNY 21000 and 30400, and HORT 30100 or equivalent. Offered in odd-numbered years.

This course emphasizes the mode and mechanics of herbicide action and their interaction with plants; and the biology and ecology of weedy plants.

BTNY 50500 Advanced Biology of Weeds Sem. 1. Class 3, cr. 3. Prerequisite: BTNY 30400.

Principles of weed biology and ecology, with focus on reproduction and ecophysiology, population dynamics, community ecology, and ecosystem level phenomena. Instruction will emphasize the development and refinement of critical thinking skills. Offered in even-numbered years.

BTNY 51500 Diseases of Fruit Crops Sem. 1. Class 3, cr. 1. Prerequisite: BTNY 30100 or equivalent. Course meets during weeks 1–5.

The purpose of this five-week miniclass is to teach students the principles and practices for identifying and controlling diseases of fruit crops. The course is designed for students who desire an intensive study of diseases of tree and small fruits. Primary emphasis will be given to symptomatology, etiology, and disease management through in-depth study of major classical diseases affecting fruit crops. Special emphasis will be placed on the practical aspects of integrated pest management systems.

BTNY 51600 Diseases of Vegetable Crops Sem. 1. Class 3, cr. 1. Prerequisite: BTNY 30100. Course meets during weeks 6–10.

The purpose of this five-week miniclass is to teach students the principles and practices for identifying and controlling diseases of vegetable crops. The course is designed for students who desire an intensive study of diseases of vegetables. Primary emphasis will be given to symptomatology, etiology, and disease management through in-depth study of major diseases affecting commercial vegetable crops in the Midwestern United States. Special emphasis will be placed on the application of modern approaches to disease control.

BTNY 51700 Diseases of Agronomic Crops Sem. 1. Class 3, cr. 1. Prerequisite: BTNY 30100 or equivalent. Course meets during weeks 11–15.

The purpose of this five-week miniclass is to teach students the disease cycles, principles, and practices for identifying and managing diseases of agronomic crops. The course is designed for students in plant protection, agronomy, entomology, and other areas who desire an intensive study of diseases of agronomic crops grown in Indiana. Primary emphasis will be given to symptomatology, etiology, and disease management through in-depth study of major diseases affecting corn, soybeans, small grains, and forage crops. Special emphasis will be placed on the practical aspects of integrated pest management systems.

BTNY 51800 Diseases of Landscape Trees and Shrubs Sem. 2. Class 3, cr. 1. Prerequisite: BTNY 30100 or equivalent. Course meets during weeks 1–5.

The purpose of this five-week miniclass is to teach students the principles and practices for identifying and controlling diseases of woody ornamental plants. The course is designed for students in horticulture and turf management who desire an intensive study of diseases of wood ornamentals. Primary emphasis will be given to symptomatology, etiology, and disease management through in-depth study of major classical diseases affecting woody ornamentals. Special emphasis will be placed on the practical aspects of integrated pest management systems.

BTNY 51900 Diseases of Greenhouse Ornamentals Sem. 2. Class 3, cr. 1. Prerequisite: BTNY 30100 or equivalent. Course meets during weeks 6–10.

The purpose of this five-week miniclass is to teach students the principles and practices for identifying and controlling diseases of greenhouse ornamentals. The course is designed for students in horticulture who desire an intensive study of diseases of greenhouse ornamentals. Primary emphasis will be given to symptomatology, etiology, and disease management through in-depth study of major classical diseases affecting herbaceous ornamentals. Special emphasis will be placed on the practical aspects of integrated pest management systems.

BTNY 52500 Intermediate Plant Pathology Sem. 1. Class 3, cr. 3. Prerequisite: BTNY 30100 or equivalent.

Examines the biological and pathological characteristics of major causal agents; concepts of epidemiology and disease assessment; physiology, genetics, and molecular biology of host-pathogen interactions; disease management practices; and methods of disease diagnosis.

BTNY 53500 Plant Disease Management Sem. 2. Class 3, cr. 3. Prerequisite: BTNY 30100 or equivalent.

An examination of the current principles, strategies, and technologies used in plant disease control. Emphasis is placed on the integration of various technologies and strategies for efficacious, environmentally sound management principles for specific types of plant diseases. Major topics include plant disease management through regulatory procedures, pathogen exclusion, pathogen eradication, environmental modification, host modification, host resistance, cultural practices, host protectants, plant disease forecasting, and the epidemiological basis of disease management strategies.

BTNY 55000 Biology of Fungi Sem. 1. Class 2, lab. 2, cr. 3. Offered in odd-numbered years.

The lectures cover general features of fungi, unique characteristics of major fungal groups, fungal interactions with other organisms, and principles of fungal genetics. Lab exercises include examination of representative species from major groups of fungi and classical and molecular manipulations of fungi.

BTNY 55100 Plant-Bacterial Interactions Sem. 1. Class 3, cr. 3. Prerequisite: BTNY 30100. Offered in odd-numbered years.

The course will explore the molecular and cellular basis of plant bacterial interactions and will focus on research from several well-studied plant-bacterial model systems (e.g. *Pseudomonas*, *Xanthomonas*, *Agrobacterium*, and *Rhizobium*).

BTNY 55200 Molecular Approaches in Plant Biology Sem. 2. Class 1, lab. 4, cr. 3. Prerequisite: BTNY 21000 or BTNY 30100.

This is mainly a laboratory exercise course designed to help students to be more familiar with common molecular techniques used in plant pathology studies. Techniques will include DNA/RNA isolation, hybridization, sequence analysis, various PCR reactions, library construction and screening, protein isolation, and plant transformation. Lectures will cover basic principles and applied aspects of molecular studies in plant pathology, and recent advances in genomics and proteomics techniques.

BTNY 55300 Plant Growth and Development (HORT 55300) Sem. 2. Class 3, cr. 3. Prerequisite: BIOL/HORT 55100 and BCHM 56100; corequisite: BCHM 56200.

Topics include seed dormancy, cell expansion and plant growth, pattern formation, phase transition, flowering, pollination and fertilization, seed development, fruit development, and senescence. This course is the second in a series of team-taught courses in the core curriculum of the Purdue Plant Biology Program.

BTNY 55500 Aquatic Botany* Sem. 1. Class 2, lab. 3, cr. 3. Prerequisite: BTNY 21000 or equivalent. Offered in even-numbered years.

The study of algae and higher plants of the aquatic environment, with emphasis on identification, ecology, morphology, physiology, role in the environment, and management.

BTNY 55600 Aquatic Plant Management Sem. 1. Class 3, Cr. 1. Prerequisite: BTNY 21000 or equivalent. Course meets during weeks 1-5. Offered in odd-numbered years.

This five-week miniclass is designed to teach students the principles and practices for identifying and managing the algae and aquatic plants that inhabit Midwestern ponds and lakes. The majority of the course involves control practices and includes the option of taking the test to become certified in Aquatic Pesticide application (Category 5). The establishment and maintenance of aquatic plants in constructed wetlands and water gardens are also covered.

BTNY 55800 Pathogens of Plants Sem. 1, Class 3, Cr. 3.

Plant pathology is the science of plant diseases and of the microorganisms that cause them, and of our attempts to manage plant disease. The ultimate goal of plant pathologists is to reduce the losses caused by diseases thereby increasing both the quality and quantity of the world food supply. Plant diseases are caused by the same types of microorganisms that cause disease in animals and humans and, as such, many of the principles that apply to human and animal medicine apply to plant diseases. It is the objective of this course to introduce students to the major types of plant pathogens (plant pathogenic bacteria, viruses, nematodes, and fungi), their basic biology and examples of the types of diseases they cause. It will be expected that students have knowledge in plant pathology.

BTNY 59000 Special Problems Sem. 1 and 2. SS. Cr. 1–3. Credit dependent upon work done.

Open to graduate students and qualified undergraduates who desire to study special problems in plant science not covered in regular coursework.

BTNY 59500 Research Methods Sem. 1 and 2. Lab. 2–6, cr. 1–3. Prerequisite: instructor approval required.

Various and current research methods ranging from computer application packages to molecular biological techniques are taught in modular form, with each module consisting of 16 hours within a two-week period. Each module will provide an introduction to the method followed by hands-on laboratory experience. Variable credit is available to students who wish to take two, four, or six modules for one, two, or three credits, respectively. Hours will be arranged with each module instructor to accommodate course conflicts. Enrollment is limited to six students per module. Consent for enrollment is provided by course coordinator. Modules offered vary by semester.

Entomology

Undergraduate Level/Lower-Division Courses

ENTM 10000 Orientation to Entomology at Purdue Sem. 1. Class 1, prsn. 2, cr. 1.

Introduction to the faculty, programs, opportunities, career preparation, and personal development requirements needed to succeed in a career in entomology. Course meets during weeks 1-8.

ENTM 10500 Insects: Friend and Foe Sem. 1 and 2. Class 3, cr. 3 (el. 3 to 8 A, SLA, S).

A one-semester course for non-science students who want to know more about insects — the most numerous organisms on earth. An introduction to insects and their relationship with humankind, including interesting aspects of insect biology; insects in music, decoration, history; use of insects in teaching at the elementary school level; their use in art, photography, and drawing; insects as human food.

ENTM 11000 Spider Biology Sem. 1. Class 1, cr. 1.

Intended for anyone with an interest in the fascinating world of spiders. Basic biology, identification, and ecology of this extremely successful and widespread group of arthropods.

ENTM 11100 Insects in Prose and Poetry Sem. 1 and 2. Class 1, cr. 1.

Intended for anyone with an interest in insects and related arthropods as they appear in written materials.

ENTM 20600 General Entomology Sem. 1 and 2. Class 2, cr. 2.

A general course on insect structure, function, biology, ecology, and population management. Coordinated with the ENTM 20700 laboratory as an introductory course in entomology.

ENTM 20700 General Entomology Laboratory Sem. 1 and 2. Lab. 2, cr. 1. Prerequisite or corequisite: ENTM 20600.

Laboratory exercises parallel topics presented in ENTM 20600. Insect structures and functions are studied as a basis for learning to identify insects and other arthropods.

ENTM 21000 Introduction to Insect Behavior Sem. 2. Class 3, cr. 3.

Description and introductory analysis of innate and learned insect behavior, including basic orientations and movements, behavioral periodicity, communication, chemical and structural defenses, host selection and feeding, reproduction, and insect societies. General biology and introductory entomology desirable, but not essential.

ENTM 21700 Insects in Elementary Education Sem. 1 and 2. Lab. 2, cr. 1.

A laboratory class designed for students preparing for a career in elementary education. Students learn to use insects in the classroom as learning tools to achieve educational objectives relevant to their intended grade level.

ENTM 21800 Introduction to Forensic Science (HSCI 21800) Sem. 1 and 2. Class 3, cr. 3.

Introduction to forensic investigation. Includes crime scene techniques, firearms, arson and explosives, entomology, blood spatter, blood chemistry, pathology, toxicology, anthropology, soils, botany, trace evidence, computer crime, behavioral analysis, courtroom activities, and new trends in forensic investigations. The course features guest speakers with professional duties in forensics.

ENTM 29500 Topics in Entomology Sem. 1 and 2. SS. Cr. 1–4. May be repeated for credit.

Special topics in entomology not available in other entomology courses.

Undergraduate Level/Upper-Division Courses

ENTM 31100 Insect Ecology Sem. 2. Class 2, lab. 2, cr. 3.

A general course on the role of insects in ecosystems with emphasis on important characteristics of insects and insect populations.

ENTM 31700 Insects in Agricultural Education Sem. 2. Lab. 6, cr. 1. Prerequisite or corequisite: ENTM 20600. For Agricultural Education or Science Education majors only.

This class is designed for students preparing for a career in agricultural education. Students will learn to use insects in the classroom as learning tools to achieve educational objectives relevant to middle school and secondary schools. Course meets during weeks 1-5.

ENTM 31800 Criminalistics Sem. 2. Class 3, lab. 2, cr. 4.

Crime scene management, analysis and techniques. Includes crime scene recognition and the documentation, collection, preservation and processing of crime scene evidence. The course features guest speakers with professional duties in forensics. A year of introductory chemistry is recommended.

ENTM 32000 Biodiversity Sem. 2. Class 2, cr. 2. Prerequisite: Introductory biology.

Students will gain an appreciation of biodiversity and how it is studied. Examples of ecological studies will be presented to examine the factors impacting biodiversity, the importance of biodiversity, and how we measure diversity. Offered in even-numbered years.

ENTM 33000 Principles of Biological Illustration Sem. 2. Class 2, lab. 2, cr. 3.

Basic principles and techniques used in preparing illustrations for scientific publications. Emphasis is on insects; however, the procedures are applicable to most biological disciplines.

ENTM 33500 Introduction to Insect Identification Sem. 1. Class 2, lab. 4, cr. 4. Prerequisite: ENTM 20600 and 20700 or equivalent.

This class is designed for learning more about the collection and identification of adult insects. Emphasis will be placed on collection and sampling techniques, the preparation of specimens for future study, and identification. Offered in odd-numbered years.

ENTM 34000 Insect Pests of Trees, Turf, and Ornamentals Sem. 1. Class 2, lab. 2, cr. 3.

Principles and practices for identifying and controlling insects and related pests of turf and woody ornamental plants, designed for those students in horticulture and turf management who want a one semester course in entomology and major stress on biology, symptomatology, and control.

ENTM 35100 Bee Biology and Beekeeping Sem. 1, Class 2, lab. 3, cr. 3.

A course that covers aspects of honey bee biology and agriculture intended for anyone interested in learning the necessary knowledge, skills, and confidence to become a hobby beekeeper. Colony life, social insects, bee behavior and anatomy, colony management, pollination and honey production are major topics studied.

ENTM 38000 Field Crop Diagnostic Techniques (AGRY 38000, BTNY 38000) SS. Class 1, cr. 1. Prerequisite: introductory courses in soil science, crop production, entomology, weed science, and plant pathology.

Identification of field crop problems via in-field diagnostic techniques, determination of the magnitude of problems utilizing in-field thresholds, evaluation of optional multidisciplinary management strategies, and development of appropriate strategies based upon economic, environmental, and cultural concepts.

ENTM 39000 Professional Experience Programs in Entomology Sem. 1 and 2. SS. Cr. 0. Consent of the departmental cooperative professional program coordinator required.

Supervised professional experiences in entomology, integrated pest management, or urban/industrial pest control. Programs must be preplanned and conducted under the direction of the departmental coordinator with the cooperation of an employer. Students must submit a summary report.

ENTM 40000 Entomology Study Abroad Sem. 1 and 2. SS. Credit 0–8. May be repeated for credit.

Utilized to record credits earned through participation in Purdue study abroad programs with cooperating foreign universities.

ENTM 41800 Advanced Criminalistics (HSCI 41800) Sem. 1. Class 2, lab. 2, cr. 3. Prerequisite: ENTM 31800 and 31900 and HSCI 31900 with a minimum "C" grade.

Advanced laboratory techniques for analysis of crime scene evidence. Includes toxicology, computer crime, behavior; field collection and analysis of biological evidence, DNA, bloodstains, and explosives; forensic microscopy, document examination and preparation of courtroom testimony.

ENTM 44100 Forest Entomology (FNR 44100) Sem. 1. Class 2, lab 2, cr. 3. Prerequisites: BIOL 11000 and (BIOL 11100 or BTNY 21000).

An introduction to the identity, natural history and management of insects affecting forest ecosystems. Topics include biodiversity, natural history and ecology of forest pests; forecasting and assessing the risk of insect outbreaks; and silvicultural, biological and chemical strategies for preventing and managing insect pests. Offered in odd-numbered years.

ENTM 44300 Arthropods and Diseases of Turfgrass (BTNY 44300) Sem. 2. Class 3, cr. 3. Prerequisite: BTNY 30100 and (ENTM 20600 or ENTM 20700).

The course is designed to introduce students to the biology, ecology, and management of arthropods and diseases associated with turfgrass ecosystems. The course is divided into two discrete segments with a focus on arthropods during the first half of the semester and diseases during the second half of the semester.

ENTM 44600 Integrated Plant Health Management For Ornamental Plants (BTNY 44600) Sem. 1 Class 2, lab 1, cr. 3. Prerequisites: BTNY 30100 and ENTM 20600 or 20700.

Principles and practices for diagnosing and managing diseases, Insects, and abiotic disorders of woody and herbaceous ornamental plants and turf. Designed for those students in urban forestry, horticulture, and turf management who want a one-semester course on integrated plant health management.

ENTM 46000 Aquatic Entomology Sem. 2. Class 2, lab. 2, cr. 3.

Introduction to the biology, ecology, and identification of fresh-water insects and related macro-invertebrates, with applications to water-quality assessment, sports fishing, biting-pest control, sewage treatment, etc. Designed for students with little or no background in entomology.

ENTM 49100 Capstone Experience in Entomology Sem. 1 and 2. SS. Cr. 1.

Arrangements must be made with an Entomology faculty member before registration. Students work with a faculty mentor to prepare and submit a written report, and prepare and make a presentation to the Department of Entomology.

ENTM 49200 Capstone Experience Entomology I Sem. 1 and 2, Class 1. Cr. 1.

Requirements, options, procedures and skills needed for successful Entomology capstone experience with emphasis on techniques and guidelines for formulating projects and principles of organizing and presenting information. A capstone experience proposal is produced.

ENTM 49300 Capstone Experience Entomology II Sem. 1 and 2. SS. Cr. 1-3. Prerequisite: ENTM 49200.

Students complete capstone requirements for a project and oral and written communication about the capstone project.

ENTM 49800 Special Problems in Entomology Sem. 1 and 2. SS. Cr. 1-4 (el. 7 or 8 A). Credit dependent upon work done.

Open to qualified sophomores, juniors, and seniors who want to study special problems in entomology not covered in regular coursework.

ENTM 49900 Thesis Research Sem. 1 and 2. SS. Cr. 1-6. Prerequisite: admission to honors program. May be repeated for credit.

For honors students doing specialized entomological research; report required. Arrange with academic advisor before registering.

Dual Level/Undergraduate-Graduate

ENTM 50000 Fundamentals of Entomology Sem. 2. Class 3, lab. 3, cr. 4. Prerequisite: BIOL 11000 and 11100, or 12100 and 12200, or equivalent. Offered in odd-numbered years.

An advanced course in general entomology, designed for students without an entomological background, but who wish an introduction to insect structure, function, biology, behavior, and systematics.

ENTM 50600 Advanced Insect Taxonomy Sem. 1. Class 2, lab. 4, cr. 4. Prerequisite: ENTM 20600, or consent of instructor. Offered in even-numbered years.

Classification and relationship of insects and related Arthropoda. Introduction to systematic principles. Survey of North American insect fauna, with emphasis on family identification of adults.

ENTM 51000 Insect Pest Management Sem. 1. Class 2, lab. 2, cr. 3. Prerequisite: ENTM 20600 or equivalent. Offered in even-numbered years.

Concepts of pest management and dynamics of pest populations, with emphasis on population regulation in theory and practice. The principles of applied ecology that pertain to insects and agricultural crops and systems. Identification, biology, behavior, and relationships of pests of forage, fiber, and vegetable crops.

ENTM 51500 Insecticides* Sem. 1. Class 2, lab. 3, cr. 3. Prerequisite: CHM 25700 or equivalent. Offered in odd-numbered years.

Principles and practices of insecticide and other pesticide development, use, and misuse including legal issues, economic issues, and environmental considerations.

ENTM 52100 Urban and Industrial Insect Management Sem. 1. Class 2, lab. 2, cr. 3. Prerequisite: ENTM 20600 or equivalent. Offered in even-numbered years.

Principles and practices of insect pest management in and immediately around urban and industrial structures (pests of property, food, health, and turf and ornamental plants) with emphasis on issues, new technologies, diagnosis of

pest problems, pest biology and behavior, implementation of management strategies, future directions and opportunities, and analysis of advances in urban pest management.

ENTM 52500 Medical and Veterinary Entomology Sem. 2. Class 3, cr. 3. Prerequisite: introductory biology, parasitology, or entomology course.

Introduction to the biology and control of arthropods of medical and veterinary importance, and coverage of the natural history and abatement of selected arthropod-related diseases, including arboviral encephalitis, filariasis, leishmaniasis, Lyme disease, malaria, plague, spotted fever, trypanosomiasis, and myiasis.

ENTM 52600 Urban and Industrial Vertebrate Management Sem. 2. Class 2, lab. 2, cr. 3. Prerequisite: ENTM 20600 or equivalent. Offered in odd-numbered years.

Principles and practices of vertebrate pest management in urban and industrial environments, with emphasis on the impact of these pests on our health, food supplies, and property, diagnosis of pest problems, pest biology and behavior, practical implementation of management strategies, future directions and opportunities, and analysis of advances in vertebrate management.

ENTM 54200 Insect Ecology Sem. 2. Class 4, cr. 4. Prerequisite: an ecology class or consent of instructor. Offered in odd-numbered years.

Concepts, theories, and measures of the diversity of adaptations of insects to their environments. Topical areas include insect behavioral and chemical ecology, insect-plant interactions, and insect population and community ecology.

ENTM 55000 Fundamentals of Nematology Sem. 1. Class 2, lab. 3, cr. 3 (el. 5 or 7 A). Prerequisite: BIOL 11000 and 11100, or equivalent.

Fundamentals of nematology, including isolation, identification, morphology, physiology, ecology, control, and study of interactions of nematodes with other biological forms.

ENTM 55100 Insect Physiology and Biochemistry Sem. 2. Class 3, cr. 3. Prerequisite: ENTM 20600 or equivalent introductory entomology course; BCHM 30700 or equivalent introductory biochemistry course. Offered in even-numbered years.

Basic physiology and biochemistry of insects covering development, functions of internal systems, and interactions of insects with their environments.

ENTM 55500 Theory and Practice of Biological Control Sem. 1. Class 3, cr. 3. Prerequisite: BIOL 28600 and 28700, and ENTM 51000, or equivalent. Offered in odd-numbered years.

Principles and practices in classical and integrated biological control of arthropod pests and weeds. The biological and behavioral attributes of natural enemies as related to the dynamics of host-parasite/predator systems.

ENTM 57100 Forensic Digital Imaging Sem. 1, Class 1, lab 2, cr. 2. Prerequisite or corequisite: ENTM 41800. Consent of instructor required.

An advanced course on forensic digital photo imaging: theory, application, and technique.

ENTM 59500 Special Topics Sem. 1 and 2. SS. Cr. 1-4. Prerequisite: consent of instructor.

Specialized topics not covered in other courses will be offered. The course may be repeated for credit if the course topic is not repeated. The specific topic offered will be indicated on the student's record.

Food Science

Undergraduate Level/Lower-Division Courses

FS 16100 Science of Food* Sem. 1 and 2. Class 3, cr. 3.

The chemistry, biology, and nutrition of food from production to consumption. Food-diet-health relationship. Food facts, fantasies, and practices that are important for making intelligent food decisions. Course may also be offered for dual credit with cooperating Indiana high schools upon documented approval by the Department of Food Science.

FS 16200 Introduction to Food Processing Sem. 2. lab 1. Cr. 1. Prerequisite: FS 161 and (enrolled in Food Science or Food Manufacturing Operations major) and (freshman or sophomore standing).

Application of introductory food science principles (e.g. food chemistry, food microbiology, and unit operations) to food processing; emphasis will be placed on food formulation, pilot-scale process design, and resulting food quality. May require class trips.

FS 23500 Food Sensory Science Sem. 1. Class 1, lab 1. cr. 1. Prerequisite or corequisite: Three credits of statistics. FS undergraduate students only.

Introduction to the fundamental concepts and practices of sensory analysis of food products. Technical aspects of planning and conducting human sensory panels on food products including analysis and interpretation of collected data. Class meets for 8 weeks.

FS 24500 Food Packaging Sem. 2. Class 3, cr. 2. Prerequisite: FS 16100 and three (3) credits of mathematics (MA).

Elements of packaging science, technology, and engineering applied to preservation, distribution, and marketing of food products, packaging materials, machinery, and technology; principles of diffusion and permeability; procedures for developing, evaluating, and testing food packages; packaging requirements for specific types of foods; other special topics of current interest. Course meets during weeks 1-10.

FS 29100 Special Assignments Sem. 1 and 2. SS. cr. 1-3.

Open to primarily freshmen and sophomores who desire to study special problems in science not covered in regular coursework. May be repeated for credit with instructor permission.

FS 29800 Sophomore Seminar Sem. 1. Class 1, cr. 1 (3 FS).

Current food science issues will be discussed by students, staff, and guest speakers. Career planning and improvement of communication skills will be emphasized. Not required for transfer students junior year or higher.

Undergraduate Level/Upper-Division Courses

FS 33000 Culinary Arts for the Food Scientist Sem. 1. Class 1, lab. 2, cr. 2. Prerequisite: Departmental approval and CHM 25500 or CHM 25700 or MCMP 20400.

Course bridges the gap between culinary arts and product development. It includes real-world case studies of science-based food product development by industry specialists on commercial development. In addition, there are hands-on applications of text book culinary arts topics under the direct supervision of the specialists.

FS 34000 Introduction to Food Laws and Regulations Sem. 2. Class 2. Cr. 1. Prerequisite: Sophomore standing or consent of instructor.

This course will cover basic knowledge and familiarity of the principal law and regulations governing raw and processed foods. Class meets during weeks 1-5.

FS 34100 Food Processing I Sem. 2. Class 2, lab. 3, cr. 3. Prerequisites: FS 362 and four (4) credits of physics (PHYS) and eight (8) credits of chemistry (CHM) and six (6) credits of mathematics (MA).

Applications of the fundamentals of food engineering, microbiology, and chemistry to methods of food processing and preservation; emphasis will be on processing concepts, preparation for food processing, food formulation, and thermal processing.

FS 36100 Food Plant Sanitation Sem. 1. Class 3, cr. 1. Prerequisite: Eight (8) credits of biological sciences (BIOL) and eight (8) credits of chemistry (CHM).

Relation of food-plant sanitation to good manufacturing practices and regulations affecting sanitation; organization of a food-plant sanitation program; sanitary building and equipment construction; selection of cleaning, sanitizing, and pesticidal compounds; water, air, and waste treatment; food storage and transportation. Course meets during weeks 1-5.

FS 36200 Food Microbiology Sem. 1. Class 3, cr. 3. Prerequisite: BIOL 22100.

Microbiology of foods, with emphasis on the conditions for growth of microorganisms and degradation of food components, preservation methods and use of Hazard Analysis and Critical Control Point (HACCP), and microorganisms associated with foodborne illness.

FS 36300 Food Microbiology Laboratory Sem. 1. Lab. 4, cr. 2. Prerequisite or corequisite: FS 36200 or equivalent.

Methods for enumerating, isolating, and identifying spoilage or pathogenic or fermentative microorganisms involved in food processing, preservation, and distribution.

FS 36800 Dairy Products* (ANSC 36800) Sem. 1. Class 2, lab. 2, cr. 3 (el. 5 or 7 A).

Scientific and technical aspects of procurement, processing, packaging, and quality control of fluid milk products and frozen dairy foods. Emphasis is placed on process unit operations.

FS 39000 Food Science Cooperative Work Experience Sem. 1 and 2. SS. Cr. 0. Consent of the departmental cooperative professional program coordinator required.

Supervised professional experiences in the food science industry. Programs must be preplanned and conducted under the direction of the departmental coordinator with the cooperation of an employer. Students must submit a summary report.

FS 40000 Food Science Study Abroad Sem. 1 and 2. SS. Credit 0-8. May be repeated for credit.

Utilized to record credits earned through participation in Purdue study abroad programs with cooperating foreign universities.

FS 43100 Physical Chemistry for Food and Agriculture Sem. 1. Class 3, cr. 3. Prerequisite: Eight (8) credits of Chemistry (CHM) and six (6) credits of mathematics (MA) and four (4) credits of physics (PHYS).

Introduction to the principles of physical chemistry applied to food and agricultural materials. Topics: state of matter, work, heat, enthalpy, entropy, free energy, phase equilibrium and transitions, chemical equilibrium, chemical kinetics, surfaces, and introduction to macromolecules, transport and spectroscopy. Examples and problems taken from the agricultural sciences. Teaches functional properties in terms of structure, energetics, and dynamics. Offered in odd-numbered years.

FS 44200 Food Processing II Sem. 1. Class 2, lab. 3, cr. 3. Prerequisite: FS 341.

Study of food processing and preservation methods based on the integrated knowledge of microbiology, chemistry, and food engineering; emphasis will be on temperature reduction, water activity, concentration, dehydration, irradiation, and extrusion.

FS 44300 Food Processing III* Sem. 2. Class 1, lab. 4, cr. 3. Prerequisite: FS 44200 or AGEC 42600.

Teams develop a new product from concept through marketing. Final case study defense is presented to faculty and peers. Classes include guest lectures from the food industry.

FS 44400 Statistical Process Control Sem. 1. Class 3, cr. 1. Prerequisite: Three (3) credits of statistics (STAT).

Basic concepts and techniques of solving quality problems and assuring the quality of production processes; emphasis is on quality improvement programs, problem-solving tools, control charts for variables and attributes, process capability analysis, and sampling methods. Course meets during weeks 6-10.

FS 44600 Food Process Automation Sem. 2. Class 1, lab. 2, cr. 2. Prerequisite: Three (3) credits of food science (FS) and six (6) credits of mathematics (MA).

Practical and descriptive aspects of automatic control of food manufacturing processes. Use of control systems simulation; tuning of control loops; sensors; data acquisition and transmission; simple statistical process control. Students will have hands-on experience in the pilot lab. Intended for non-engineers. Offered in odd-numbered years.

FS 45300 Food Chemistry (F&N 453) Sem. 2. Class 3, lab. 2, cr. 4. Prerequisite: (CHM 25500 or CHM 25700 or MCMP 20400 with a grade of "C" or higher) and (BCHM 30700 or BCHM 56100).

Application of fundamental laws and concepts of chemistry, physics, and biology to the properties, composition, and storage of foods.

FS 45500 Cereal Chemistry and Processing Sem. 1, Class 2, cr. 2. Prerequisite: Junior or senior standing.

Cereal grain structure, chemical and functional properties, and nutritional aspects related to grain milling and processing. Cereal processing covers dry and wet milling, brewing, baked products, pasta, breakfast cereals, snack foods, and traditional cereal foods from other countries. Offered in even-numbered years.

FS 46700 Food Analysis Sem. 2. Class 3, lab. 2, cr. 4. Prerequisite: (FS 45300 or F&N 45300) and CHM 22400 and three (3) credits of statistics (STAT).

Application of quantitative and qualitative physical, chemical, and instrumental methods of analysis to the examination of food products; evaluation of methods; data analysis; and interpretation of results.

FS 47000 Wine Appreciation Sem. 1 and 2. Class 3, cr. 3. Prerequisite: 21 years of age or older.

A study of wine production and marketing principles with an emphasis upon consumption responsibility. Historical perspectives form the foundations for wine classification systems and traditional serving procedures. Cardinal scale sensory evaluations are conducted in relationship to various food pairings.

FS 48200 Food Science Senior Seminar Sem. 1. Class 3, cr. 1. Prerequisite: (Enrolled in Food Science or Food Manufacturing Operations major) and senior standing.

Oral and written reports on selected food science topics. Course meets for five weeks.

FS 49100 Special Assignments Sem. 1 and 2. SS. Cr. 1-3.

Open primarily to qualified seniors who desire to study special problems in science not covered in regular coursework.

FS 4990 Thesis Research Sem. 1 and 2. SS. Cr. 1–6. Prerequisite: admission to the honors program. May be repeated for a maximum of six credits.

For honors students doing independent research.

Dual Level/Undergraduate-Graduate

FS 5300 Food Ingredient Technology Sem. 2. Presentation 1, cr. 1. Prerequisite or corequisite: FS 45300 or F&N 45300.

This course identifies functions of ingredients listed on ingredient labels of food products, and discusses alternative ingredient choices for food products.

FS 54100 Postharvest Technology of Fruit and Vegetables (HORT 54100) Sem. 2. Class 3, cr. 1. Prerequisite or corequisite: an introductory course in biochemistry. Course meets during weeks 11–15.

Theoretical and applied aspects of methods being used for enhancing the quality and shelf life of harvested fruits and vegetables. Factors that affect the longevity of produce and technology used to control these factors and reduce deterioration of produce between harvest and consumption will be emphasized.

FS 56400 Food Fermentations Sem. 2. Class 2, cr. 2. Prerequisite: FS 36200 or equivalent. Offered in even-numbered years.

Microbiology and biochemistry of traditional and nontraditional food fermentations, starter culture technology used in food fermentations, new developments in the use of microorganisms for food and energy.

FS 56500 Microbial Foodborne Pathogens Sem. 1. Class 3, cr. 3. Prerequisite: one semester of general biochemistry, one semester of general microbiology, and FS 36200. Offered in odd-numbered years.

Microbial pathogens involved with foodborne disease. Course emphasis is on molecular and genetic bases of virulence of bacterial foodborne pathogens. Topics include statistics on foodborne outbreaks, immune response to bacterial infection, molecular methods for detection, mechanisms of pathogenesis of specific infectious and intoxicating foodborne pathogens, foodborne mycotoxins/viruses/parasites, and HACCP programs.

FS 56600 Microbial Techniques for Food Pathogens Sem. 2. Lab. 6, cr. 2. Prerequisite: BIOL 22100 or 43900 or FS 36300. Course meets during weeks 6-15. Offered in even-numbered years.

Molecular biology, immunochemistry and tissue culture – based rapid and automated techniques currently used for detection and identification of foodborne pathogens will be covered in this laboratory course. The techniques include metabolic fingerprinting identification system, enzyme immunoassay and dot blotting. lateral flow assay, polymerase chain reaction, genomic fingerprinting, cytotoxicity assays, and selected biosensor tools. Laboratory experiments are scheduled for four hours, with up to two additional hours of arranged time.

FS 59000 Special Problems Sem. 1 and 2. SS. Cr. 1–5. Prerequisite: approval by appropriate instructor before registration.

Specialized study in research laboratories, libraries, or computer laboratories for problems related to food science that are not taught in regular courses.

FS 59100 Special Topics Sem. 1 and 2. SS. Cr. 1–3.

Specialized topics not covered in other courses will be offered. Topics, requirements, and credits to be determined yearly. Course may be repeated by a student when different topics are taught.

Forestry and Natural Resources

Undergraduate Level/Lower-Division Courses

FNR 10300 Introduction to Environmental Conservation Sem. 1 and 2. Class 3, cr. 3 (el. 1 A).

Introduction to ecological principles, history of conservation, natural resource management, human impacts on the environment, and environmental ethics. For all students interested in an introductory natural resource or environmental science elective.

FNR 19800 Introductory Topics in Forestry and Natural Resources Sem. 1 and 2. SS. Cr. 1–3. Prerequisite: consent of instructor.

Subjects and problems of interest to the student.

FNR 20100 Marine Biology Sem. 1. Class 3, cr. 3. Prerequisite: BIOL 11000 or BIOL 12100.

An introduction to the major groups of marine organisms and their habitats. Emphasis on application of ecological principles to the conservation of important marine species. Offered in even-numbered years.

FNR 20300 Freshwater Ecology Sem. 1, Class 2, lab 3, cr. 3. Prerequisite: BIOL 11000 and (CHM 11200 or CHM 11500).

Comprehensive overview of the form, function, and biological organisms of freshwater ecosystems. Students will learn the fundamental biological and ecological components of continental streams, rivers, and lakes with some additional consideration given to global freshwaters. Concepts will be taught based on two lectures and one laboratory each week during the fall semester. Labs are partially field-based and require outside activities.

FNR 21000 Natural Resource Information Management Sem. 2. Class 2, lab. 2, cr. 3.

Introduction to natural resource and land information systems and data management technologies. Principles of data storage, organization, and retrieval for both textual and spatial data (geographic information systems), data acquisition, accuracy assessment, mapping, and use of this data in natural resource management are presented.

FNR 22500 Dendrology Sem. 1. Class 2, lab. 3, cr. 3. Prerequisite: BIOL 11000 or BTNY 21000, or equivalent.

Field identification, taxonomy, and ecological characteristics of trees, shrubs, and herbs found in forests, prairies, old fields, and wetlands.

FNR 23000 The World's Forests and Society Sem. 1. Class 3, cr. 3.

Examination of structure, function, and environmental and cultural significance of forest ecosystems throughout the world.

FNR 24000 Wildlife in America Sem. 1. Class 3, cr. 3.

History of the occurrence, exploitation, and management of North America's wildlife resources. Life histories, habitat relationships, and human impacts on selected species. Current conservation practices and future prospects.

FNR 24100 Ecology and Systematics of Fishes and Mammals Sem. 1. Class 3, cr. 3. Prerequisite: BIOL 11000 or BIOL 12100 or BTNY 21000.

Introduction to the ecology and systematics of fishes and mammals. Discuss the evolutionary adaptations and ecological processes of these vertebrate groups at the individual, population, and community levels. Examine the

roles of phylogeny, physiology, morphology, and behavior in influencing organismal responses to the environment. Assess issues related to the conservation of fishes and mammals.

FNR 24200 Laboratory in Ecology and Systematics of Fishes and Mammals Sem. 1. Lab. 2, cr. 1. Prerequisite: BIOL 11000 or BIOL 12100 or BTNY 21000.

Basic anatomy, classification, and identification of fishes and mammals. Identification deals with representative species from selected phylogenetic and geographic groupings in North America.

FNR 25100 Ecology and Systematics of Amphibians, Reptiles, and Birds Sem. 2. Class 3, cr. 3. Prerequisite: BIOL 11000 or BIOL 12100 or BTNY 21000.

Introduction to the ecology and taxonomy of amphibians, reptiles, and birds. Discuss the evolutionary adaptations and ecological processes of these vertebrate classes at the individual, population, and community levels. Examine the roles of phylogeny, physiology, morphology, and behavior in influencing organismal responses to the environment. Assess the issues related to the conservation of amphibians, reptiles, and birds.

FNR 25200 Laboratory in Ecology and Systematics of Amphibians, Reptiles, and Birds Sem. 2. Lab. 2, cr. 1. Prerequisite: BIOL 11000 or BIOL 12100 or BTNY 21000.

Basic anatomy, classification, and identification of amphibians, reptiles, and birds. Identification deals with representative species from selected phylogenetic and geographic groupings in North America.

Undergraduate Level/Upper-Division Courses

FNR 30100 Wood Products and Processing Sem. 2. Class 3, cr. 3.

Wood processing methods, including hardwood and softwood sawmilling, veneering, pallets, lumber drying, plywood, particleboard, medium density fiberboard, and oriented strandboards; wood preservation including crossties, poles, and pilings; furniture; cabinets; millwork; pulp and paper; and wood residues. In addition to processing methods, the grading of material, including logs, and consideration of applicable standards, and trade journals are emphasized.

FNR 30500 Conservation Genetics Sem. 2. Class 3, cr. 3. Prerequisite: BIOL 11000, BIOL 286, and STAT 30100.

Fundamentals and principles of genetics, including Mendelian inheritance, genetic mapping and linkage, DNA fingerprinting, phylogeography, speciation. Topics cover the theoretical and empirical evidence illustrating how mutation, migration, drift, and natural selection influence the evolution of genes in natural populations. Designed for ecologists and natural resource professionals.

FNR 31000 Harvesting Forest Products Sem. 2. Class 2, cr. 2. Prerequisite: FNR 33900.

Principles and techniques of timber harvesting. Terminology, machine performance, operating costs, and efficient management of labor, capital, machines, and timber.

FNR 31100 Wood Structure, Identification, and Properties Sem. 2. Class 2, lab. 3, cr. 3.

An outline of the macroscopic, and to a lesser extent, the microscopic characteristics of commercial North American woods. These characteristics allow identification of most woods on sight. Uses, availability, distribution, and unique characteristics are discussed.

FNR 32200 Forest Soil: Properties, Processes, and Management Sem. 1. Class 3, cr. 3. Prerequisite: (AGRY 25500 or AGRY 27000) and FNR 22500.

Forest soil characteristics with respect to site evaluation, watershed management, planting, problems, and silvicultural applications.

FNR 33100 Forest Ecosystems Sem. 1. Class 2, lab. 3, cr. 3. Prerequisite: BIOL 28600 and FNR 22500 and (FNR 34800 or FNR 35100 or FNR 35300). Prerequisite or corequisite: AGRY 25500 or AGRY 27000.

Introduction to ecosystem processes, with emphasis on structural dynamics, energy flows, nutrient cycling, spatial patterns, classification and interaction of plant and animal populations. Processes will be related to human activities.

FNR 33300 Fire Effects in Forest Environments* Sem. 2. Class 1, cr. 1. Prerequisite: FNR 33100.

Use of natural and set prescribed fire as a tool in management of forest and prairie ecosystems.

FNR 33900 Principles of Silviculture Sem. 1. Class 2, lab. 4, cr. 3. Prerequisite: BIOL 28600 and FNR 22500 and FNR 37200.

Silviculture systems; establishment of stands; control of stand composition, growth, and quality.

FNR 34100 Wildlife Habitat Management Sem. 2. Class 2, lab. 3, cr. 3. Prerequisite: FNR 22500 and FNR 37000.

Principles, practices, and justification of the habitat management approach to the manipulation of wildlife populations.

FNR 34800 Wildlife Investigational Techniques Sem. 2. Class 2, lab. 3, cr. 3. Prerequisite: FNR 24200 and MA 22300 and STAT 30100. Prerequisite or corequisite: FNR 25200 and MA 22400.

An introduction to current wildlife research techniques that are used in managing populations and habitats. Laboratory and field exercises are used to gather and analyze data; basic data analysis and written dissemination of results is emphasized.

FNR 35100 Aquatic Sampling Techniques Sem. 2. Class 2, lab. 3, cr. 3. Prerequisite: FNR 24200 and MA 22300 and STAT 30100. Prerequisite or corequisite: FNR 25200 and MA 22400.

An introduction to laboratory and field sampling methods in aquaculture, limnology, and fisheries biology. Emphasis will be placed on the proper use of laboratory equipment and sampling gears, as well as the development of sampling protocols for collecting representative, non-biased fisheries and aquatic sciences data.

FNR 35300 Natural Resources Assessment Sem. 2. Class 2, lab. 2, cr. 3. Prerequisite: MA 22400 and STAT 30100. Prerequisite or corequisite: MA 22400.

An introduction to sampling techniques and fundamental principles for measuring natural resources.

FNR 35500 Quantitative Methods for Resource Management Sem. 2. Class 3, cr. 3. Prerequisite: FNR 35300 and MA 22400 or equivalent.

Application of analytical and computational techniques for the purpose of making decisions regarding the management of forests.

FNR 35700 Fundamental Remote Sensing Sem. 1. Class 2, lab. 3, cr. 3.

Introduction to the principles of remote sensing, aerial photo interpretation, photogrammetry, geographic information systems, and global positioning systems. Primary applications of geospatial science and technology in forestry and natural resources.

FNR 35900 Spatial Ecology and GIS Sem. 1. Class 2, lab. 3, cr. 3. Prerequisite: FNR 21000.

Introduction to the principles of landscape ecology and biogeography with a laboratory devoted to the analysis of spatial data using geographic information systems.

FNR 36500 Natural Resources Issues, Policy, and Administration Sem. 1. Class 3, cr. 3.

The process, history, and development of natural resource conservation laws and policies, and current issues as they affect resource management in the United States.

FNR 37000 Natural Resources Practicum SS. Cr. 2. Prerequisite: FNR 22500 and FNR 24200 and FNR 25200 and (FNR 34800 or FNR 35100 or FNR 35300).

Field instruction and practice during the summer following the sophomore year. All students focus on land measurement and surveying, inventory of forest, wildlife, and aquatic resources, and integrated resource management. Followed by specific modules in fisheries, forestry, and wildlife management. Students pay university tuition plus a fee for living facilities and subsistence.

FNR 37100 Fisheries and Aquatic Sciences Practicum SS. Cr. 4. Prerequisite or corequisite: FNR 37000.

Specific field instruction in fisheries and aquatic sciences. Students pay university tuition plus a fee for living expenses and subsistence.

FNR 37200 Forestry Practicum SS. Cr. 4. Prerequisite or corequisite: FNR 37000.

Specific field instruction in forestry. Students pay university tuition plus a fee for living expenses and subsistence.

FNR 37300 Wildlife Practicum SS. Cr. 4. Prerequisite or corequisite: FNR 37000.

Specific field instruction in wildlife science and management. Students pay university tuition plus a fee for living expenses and subsistence.

FNR 37400 International National Resources Practicum SS. Cr. 4. Prerequisite or corequisite: FNR 37000.

This is an international alternative to the required departmental summer practicum that may be elected by students in the different disciplines of Forestry and Natural Resources. Field instruction and practice in an international setting during the summer following the sophomore year. Students take two weeks of common coursework with FNR 37000 students in forestry, wildlife, fisheries, and natural resources, and then undertake international training according to area of interest for three or more weeks. The location of the international training is open, but a plan of study and a cooperating institution must be approved by departmental faculty. Students pay university tuition plus a fee for travel, living facilities, and subsistence.

FNR 37500 Human Dimensions of Natural Resource Management Sem. 2. Class 2, recitation 1, cr. 3.

Prerequisite: AGEC 52500, FNR 36500, POL 22300, 32300, 42300, or 52300.

An introduction to the human dimensions of forestry, wildlife, and recreation; students will learn how values, attitudes, community, and behavior relate to natural resource management and decision-making; various natural resource management stakeholders such as private landowners, natural resource agencies, the judiciary, and environmental and natural resource interest groups will be discussed; course will utilize case studies specific to Indiana and the Midwest; course includes weekly discussions during recitations.

FNR 39000 Cooperative Professional Program Sem. 1 and 2. SS. Cr. 0. Prerequisite: admission to forestry co-op program.

Supervised professional experience in forestry. Programs must be preplanned and conducted under the direction of a forestry faculty coordinator with the cooperation of an employer. Students must submit a summary report.

FNR 40000 Forestry and Natural Resources Study Abroad Sem. 1 and 2. SS. Credit 0–8. May be repeated for credit.

Utilized to record credits earned through participation in Purdue study abroad programs with cooperating foreign universities.

FNR 40600 Natural Resource and Environmental Economics (AGEC 40600) Sem. 1. Class 3, cr. 3.

Prerequisite: AGEC 10000 or AGEC 20300 or 20400 or ECON 25100.

Introduction to economic models of renewable and nonrenewable natural resources and the use of these models in the analysis of current resource use and environmental issues.

FNR 40700 Forest Economics Sem. 2. Class 2, lab 2, cr. 3. Prerequisite: FNR 40600 or consent of instructor.

Implications of unique economic characteristics of forest resources, including a tree as both capital and output, high capital to output ratio, location utility of in-forest uses, long investment periods, and non-market outputs.

FNR 40800 Natural Resources Planning Sem. 2. Class 2, lab. 3, cr. 3. Prerequisite: FNR 40600, (FNR 34100 or FNR 40900 or FNR 54500 or FNR 54700) and FNR 37500.

Management concepts and decision-making emphasizing formal planning processes including development of objectives, analysis of alternatives, and decision-making within the constraints of changing social and political trends, economic feasibility, and sustainability of ecosystem functions for a property. Laboratory activities are focused on the development of a management plan by an interdisciplinary team for a specific area and set of objectives.

FNR 40900 Timber Management Sem. 1. Class 3, cr. 3. Prerequisite: FNR 33900 and FNR 35500 and FNR 40700.

Application of financial and biological principles to determine optimal production of wood as a raw material on industrial and non-industrial ownerships. Optimal rotation and stocking level for individual trees and stands. Forest regulation for both even-aged and uneven-aged stands for long-term sustainability and certification. Timber harvest scheduling using mathematical programming techniques.

FNR 41200 Natural Resources Decision Making Sem. 2. Class 3, cr. 3. Prerequisite: AGEC 21700 or AGEC 20400 and STAT 30100.

Students will learn decision analysis and how to apply it to a mix of natural resource problems. Students will learn elements of a decision model, how to structure decision problems, making choices, and conducting sensitivity analyses under certainty. Decision making under conditions of uncertainty and the preferences of one or more decision makers will be introduced to reflect real world decision making.

FNR 41800 Properties of Wood Related to Manufacturing Sem. 1. Class 2, lab. 3, cr. 3. Prerequisite: FNR 31100.

Orthotropic nature of wood, grain, texture, moisture content, shrinking, swelling, specific gravity, machining, thermal properties, electrical properties, elastic properties, strength properties, vibration properties, bending, natural characteristics affecting mechanical properties, effect of manufacturing and service environment on mechanical properties, changing quality of available resources and implications of wood quality changes for manufacturing.

FNR 41900 Furniture and Cabinet Design and Manufacture Sem. 2. Class 2, lab. 3, cr. 3. Prerequisite: MET 21200.

Qualitative and quantitative principles of furniture construction, performance testing of furniture, and computer-based applications and solutions. Course features laboratory evaluation of fasteners and furniture joints.

FNR 42500 Secondary Wood Products Manufacturing* Sem. 1. Class 3, cr. 3. Prerequisite: FNR 30100 and 41800.

Secondary wood products manufacturing; structure of the industry, organization of a furniture factory, raw materials, rough mill, finish mill, assembly, finishing, machinery, wood machining, plant layout, production methods, modern industrial engineering concepts; includes visits to manufacturing operations.

FNR 43400 Tree Physiology Sem. 1. Class 3, cr. 3. Prerequisite: (BIOL 11000 or BTNY 21000) and BIOL 28600.

Study of physiology of growth and development of woody plants. Emphasis on the structure and functions of trees and their physiological response to environmental factors.

FNR 44100 Forest Entomology (ENTM 44100) Sem. 1. Class 2, lab. 2, cr. 3. Prerequisite: BIOL 11000 and (BIOL 11100 or BTNY 21000).

An introduction to the identity, natural history and management of insects affecting forest ecosystems. Topics include biodiversity, natural history and ecology of forest pests; forecasting and assessing the risk of insect outbreaks; and silvicultural, biological and chemical strategies for preventing and managing insect pests. Offered in odd-numbered years.

FNR 44400 Arboricultural Practices Sem. 1. Class 2, lab. 4, cr. 4. Prerequisite: junior standing.

Course covers a broad spectrum of arboriculture principles and techniques, including pruning, transplanting, fertilization, climbing, rigging, removal, cabling, bracing, lightning protection, hazard tree evaluation, tree appraisal, and street tree inventory.

FNR 44500 Urban Forest Issues Sem. 2. Class 2, lab 2, cr. 3. Prerequisite FNR 22500 or consent of instructor.

This course presents an array of topics germane to the management of trees in the urban environment. This includes the benefits of trees and general tree care, tree appraisal, tree ordinances, tree inventory and management plans, and tree preservation and construction.

FNR 44700 Vertebrate Population Dynamics Sem. 1. Class 3, lab. 2, cr. 4. Prerequisite: MA 22400 and STAT 30100.

Estimation and analysis of populations; computer modeling of sampling methods, population dynamics, population and habitat management. Knowledge of computer programming not required.

FNR 45200 Aquaculture Sem. 2. Class 3, cr. 3. Prerequisite: FNR 20100 or FNR 20300.

Historical perspectives and current practices in aquaculture, including production systems, feeds, water quality requirements, and diseases of commercially important species.

FNR 45300 Fish Physiology Sem. 2. Class 3, cr. 3. Prerequisite: (ANSC 23000 or BMS 30000), COM 11400, and (FNR 24100 and FNR 24200).

Presentation and discussion of physiological mechanisms exhibited by freshwater and marine invertebrates and vertebrates. Primary materials used for class presentation and discussions will be examples from primary research literature. Topics include respiration, osmoregulation, stress physiology, absorption and metabolism of compounds, and hormonal control of selected physiological mechanisms. Offered in odd-numbered years.

FNR 45400 Fisheries Science and Management Sem. 1. Class 2, lab 2, cr. 3. Prerequisite: FNR 20300 and MA 22400 and STAT 30100.

Theory and practice of fisheries management, with emphasis on strategies utilized for the management of freshwater and marine fisheries. Application of quantitative methodologies for the assessment and manipulation of aquatic habitats, sport and commercial fish populations, and human resource users and non-users are considered, as in the setting of appropriate goals and objectives for effective, science-based management. One weekend field laboratory is required.

FNR 45500 Fish Ecology Sem. 2. Class 3, cr. 3. Prerequisite: (BIOL 286 and FNR 20300) and (FNR 241 and FNR 242).

The relationship of fishes to the physical, chemical, and biological features of their environment in both natural and perturbed aquatic ecosystems. An emphasis will be placed on diversity in morphology, behavior feeding, and reproductive strategies as they relate to individual and population adaptation, community structure, and anthropogenic effects. Offered in even-numbered years.

FNR 46000 International Natural Resources Summer Program* SS. Cr. 3. Prerequisite: BIOL 11100 or BTNY 21000.

A four-week, intensive program examining the management and conservation of natural resources in Europe and the United States. Jointly taught with faculty and students from the Swedish University of Agricultural Sciences. The program topic and venue change each year, but emphasis is placed on student interaction and internationalization as well as on cross-cultural communication skills within a natural resources framework. Offered in even-numbered years at Purdue University and in odd-numbered years at the Swedish University of Agricultural Sciences in Sweden. May be repeated once for credit as the course topic changes each year.

FNR 47000 Fundamentals of Planning Sem. 1. Class 3, cr. 1.

This course will overview key steps involved in natural resources planning, expose students to a variety of different natural resource plans, and engage students in critically evaluating the effectiveness of planning. Course meets during weeks 1-5.

FNR 48400 Design for Computer Numerical Controlled Manufacturing Sem. 1. Class 2, lab. 3, cr. 3. Prerequisite: consent of instructor required.

The course objective is to familiarize students with Computer Aided Design (CAD), Computer Aided Manufacturing (CAM), Computer Numerical Controlled (CNC) router operation, rapid prototyping and basics of secondary wood products manufacturing.

FNR 48800 Global Environmental Issues Sem. 1. Class 3, cr. 3.

Examination of the state of the world in terms of natural resource consumption, environmental quality, and global change. Techniques to analyze and evaluate information. Survey threats to soil productivity, the changing atmosphere, water quality and quantity, energy impacts, and biodiversity from an ecosystem perspective.

FNR 49800 Special Assignments Sem. 1 and 2. SS. Cr. 1-3 (el. 7 or 8 A, F). Prerequisite: consent of instructor required.

Supervised individual research.

FNR 49900 Thesis Sem. 1 and 2. SS. Cr. 1-6. Prerequisite: admission to honors program.

Dual Level/Undergraduate-Graduate

FNR 50700 Advanced Forest Economics Sem. 2. Class 3, cr. 3. Prerequisite: ECON 25100, MA 223 and 22400, or equivalents. Offered in odd-numbered years.

Application of capital and financial theory to timber management, including optimal stocking, rotation length, and regulation. Necessary and sufficient conditions for renewability at micro- and macroeconomic levels. Price determination in timber and wood products markets.

FNR 50800 Economics of Property Rights Sem. 2. Class 3, cr. 3. Prerequisite: ECON 25100 or equivalent. Offered in even-numbered years.

Survey of historical derivation of property rights structures in eastern and western cultures, specification of conditions for well-defined property rights, implications of poorly defined rights and corrective measures, and measurement of transactions costs. Theory is applied to renewable and non-renewable natural resources.

FNR 51100 Population Genetics (AGRY 51100, ANSC 51100) Sem. 1. Class 3, cr. 3. Prerequisite: AGRY 32000; corequisite: STAT 50300 or 51100.

Basic concepts of population genetics. Characterization of populations using gene frequencies, gametic and zygotic disequilibrium; forces changing gene frequencies (mutation, migration, selection, and random gene drift) and genotypic frequencies (mating systems: inbreeding, crossbreeding, and phenotypic assortative) and related hypothesis testing; gene trees and the coalescent process; molecular phylogenies.

FNR 52200 Advanced Forest Soils Science* Sem. 1. Class 3, cr. 3. Prerequisite: AGRY 36500, FNR 32200 and 33100, or equivalent courses. Offered in even-numbered years.

A study of the nutrient dynamics of forest ecosystems, with emphasis on the physical, chemical, and biological processes influencing nutrient cycling, roots and soil-root interactions, in-depth study of the C, N, and P cycles, and the impact of environmental change on the processes controlling these cycles. Special topics include fertilization, soil management, and acidic deposition.

FNR 52600 Aquatic Animal Health Sem. 1, Class 1, Lab 3, cr. 2. Prerequisites: Graduate Standing or Consent of instructor.

This is an introductory course designed to provide instruction on the methodology of diagnosis and treatment of parasitic, fungal, bacterial, viral, nutritional, and environmental diseases of fish and other aquatic organisms (amphibians, reptiles, and bivalves). Courses in chemistry and biology are expected and in animal physiology is preferable, but not required. Offered in even-numbered years.

FNR 52700 Ecotoxicology Sem.1, Class 2, cr. 2. Prerequisites: Graduate Standing or Consent of instructor.

This course covers theoretical and applied approaches to the science of ecotoxicology, including application of the tools and procedures used to understand toxicant fate and effects in free-ranging animals and ecosystems. Students are expected to be knowledgeable in chemistry, biology and animal physiology. Offered in odd-numbered years.

FNR 53500 Forest Regeneration Sem. 1. Class 3, cr. 3. Prerequisite: BTNY 21000 and FNR 33900, or equivalent. Offered in even-numbered years.

An overview of the dynamics associated with the regeneration of forestlands in North America. Topics include seed collection and handling, forest tree nursery operations, seedling quality, managing for environmental stresses, planting operations, early stand management, and natural regeneration.

FNR 54300 Conservation Biology I Sem. 1. Class 3, cr. 3. Prerequisite: course in advanced ecology and consent of instructor. Offered in odd-numbered years.

Introduction to conservation biology, including population dynamics and genetic structure of rare organisms. Recovery planning, restoration ecology, environmental policy making, and sustainable developments are considered as is ethics in conservation and biological diversity.

FNR 54400 Conservation Biology II Sem. 1. Class 3, cr. 3. Prerequisite: FNR 54300. Offered in even-numbered years.

Advanced study of a specific topic within the field of conservation biology. Topics will vary from year to year, depending on the interests of students enrolled, and will emphasize current advances or issues in the field. May be repeated for credit.

FNR 55000 Fisheries Stock Assessment and Modeling. Sem.2. Class 3, cr. 3. Prerequisites: FNR 54500 or consent of instructor. Offered in odd-numbered years.

Theory and application of models and other quantitative analyses for the assessment and management of recreational, commercial, and non-game fishes. Emphasis will be placed on the estimation of basic fish population dynamics, and the development and application of models used to predict and assess fisheries management outcomes.

FNR 55100 Advanced Ichthyology Sem. 2. Class 2, lab 3, cr. 3. Prerequisite: FNR 24100, FNR 35100 and BIOL 28600.

Advanced ichthyology presents an advanced study of the biology of fishes. In particular, the course covers aspects of the morphology, physiology, development, behavior, evolution, diversity and ecology of fishes of fish throughout the world. Offered in odd-numbered years.

FNR 55200 Advanced Freshwater Ecology Sem. 2, Class 3, cr. 3. Prerequisite: FNR 24100, FNR 35100 and BIOL 28600.

Advanced freshwater ecology presents a comprehensive overview of the form, function, and biological organisms of freshwater ecosystems. Specifically, students will learn the fundamental biological and ecological components of continental streams, rivers, and lakes with some additional consideration given to global freshwaters. Offered in even-numbered years.

FNR 55800 Digital Remote Sensing and GIS Sem. 1. Class 2, lab. 3, cr. 3. Prerequisite: FNR 35700.

Advanced course in the use of digital remote sensing techniques and geographic information systems (GIS) for renewable natural resources management. Emphasizes the physical principles behind the digital remote sensing of vegetative features, present-day instrument technology, spatial data processing and analysis algorithms, error analysis and accuracy assessment procedures, and multi-source data integration. Provides hands-on experience with forest canopy modeling, atmospheric modeling, image processing, and GIS software on microcomputer and workstation platforms.

FNR 56700 Advanced Mammalogy Sem. 2. Class 2, lab. 3, cr. 3. Prerequisite: FNR 24100, 24200 and 44700.

This class explores approaches to mammalian research and wildlife management through readings, discussions, field, and laboratory exercises. Topics such as mammalian behavior, ecology, phylogeny, taxonomy and conservation are emphasized. The intention for this class is to help students who have a sincere interest in mammalian research and management to progress beyond identification in their understanding of mammals. Offered in odd-numbered years.

FNR 57100 Advanced Ornithology. Sem. 2. Class 2, lab 1, cr. 3. Prerequisite: FNR 25100 and 25200, or equivalent ornithology course. Consent of instructor required. Offered in odd-numbered years.

Study of current avian research topics and techniques. Class discussion of recent scientific literature; field and laboratory exercises to illustrate approaches to ornithological research. One weekend field trip is offered.

FNR 57200 Community Involvement in Natural Resource Management Sem. 1. Class 2, cr. 2. Prerequisite: FNR 47000.

Engaging the public in natural resource decision making is an increasingly important and complex task. This course will provide an overview of how to include diverse stakeholders in decision making, collaboration and conflict resolution through readings, class discussions and role plays.

FNR 57300 Community Involvement Practicum Sem. 1. Lab 2, cr. 1. Corequisite: FNR 57200.

Students who enroll in this course will participate in a service learning activity that enables them to apply course concepts from FNR 57200 to a “real life” context. This course must be taken concurrently with FNR 57200 Community Involvement in Natural Resource Management. Students enrolling FNR 57200 are not required to take this course.

FNR 57500 Human Dimensions of Natural Resource Management. Sem. 2. Class 3, cr. 3. Prerequisites: FNR 37500 or graduate student classification.

An introduction to the human dimensions of forestry, fisheries, wildlife, watershed management, and recreation. Students will learn how values, attitudes, community characteristics, and behavior relate to natural resource management and decision-making. Various natural resource management stakeholders, such as private landowners, natural resource agencies, the judiciary, and environmental natural resource interest groups, will be discussed. The course will utilize case studies specific to Indiana and the Mid-West as well as other regions of the United States. Weekly discussions and a semester long research project are required.

FNR 57900 Remote Sensing Seminar Sem. 2. Class 1, cr. 1. Prerequisite: AGRY 54500, or ECE 57700, or FNR 55800. Offered in even-numbered years.

Staff and student presentations and discussions concerning instrumentation, analysis techniques, applications, and other aspects of remote sensing technology. An interdisciplinary course intended to involve students in forestry, agronomy, civil engineering, electrical engineering, natural resources, landscape architecture, geosciences, and other disciplines.

FNR 58000 Research Methods for Natural Resource Social Science Sem. 1. Class 3, cr. 3.

This class covers basic elements of research design for social scientists with an emphasis on issues pertinent to natural resource management. Topics to be covered include the role of theories and paradigms in designing sound research, writing research questions and hypotheses, and the importance of validity and reliability in research design. Qualitative, quantitative and mixed methods designs will all be presented and discussed.

FNR 59800 Topical Problems in Forestry and Natural Resources Sem. 1 and 2. SS. Cr. 1–3. Prerequisite: consent of instructor.

Subjects and problems of interest to the student.

Horticulture

Undergraduate Level/Lower-Division Courses

HORT 10100 Fundamentals of Horticulture* Sem. 1 and 2. Class 2, lab. 2, cr. 3.

Biology and technology involved in the production, storage, processing, and marketing of horticultural plants and products. Laboratories include experiments demonstrating both the theoretical and practical aspects of horticultural plant growth and development.

HORT 10300 Horticultural Science Sem. 1 and 2. Class 2, lab 3, cr. 3.

Biology and technology involved in the production, storage, processing, and marketing of horticultural plants and products. Laboratories include experiments demonstrating both the theoretical and practical aspects of horticultural plant growth and development with enhanced experiential learning. Enrollment is limited to students in the College of Agriculture.

HORT 11000 Survey of Horticulture Sem. 2. Class 1, cr. 1.

A survey of the field of horticulture, with emphasis on horticultural information and career opportunities. This course will utilize a lecture format with a combination of presentations by the instructor and guest speakers with expertise and experience in specialized areas of horticulture.

HORT 20100 Plant Propagation Sem. 2. Class 2, lab. 2, cr. 3. Prerequisite: HORT 10100 or BTNY 21000.

Theoretical and applied aspects of controlled plant reproduction by sexual and asexual techniques, including seeds, grafting and budding, layering, cuttings, micropropagation (in vitro culture), and specialized structures. Lectures emphasize morphological changes and physiological processes involved in plant propagation. Laboratory exercises illustrate the practical applications of propagation techniques.

HORT 21700 Woody Landscape Plants Sem. 1. Class 2, lab. 3, recitation 1, cr. 4 (el. 3 A).

Recognition and identification of woody landscape plants; plant characteristics in terms of landscape function.

HORT 21800 Herbaceous Landscape Plants* Sem. 1. Class 2, lab. 2, cr. 3.

Covers important herbaceous ornamentals, with emphasis on annuals, perennials, bulbs, and ground covers; recognition; cultural requirements; and use in landscape plantings.

HORT 22200 DynaSCAPE Applications in Horticulture Sem. 2. Class 1, lab 4, cr. 1 (Weeks 6-10).

This course will teach students how to use DynaSCAPE™ software for horticultural landscape design applications.

HORT 22300 AutoCAD Applications in Horticulture Sem. 2. Class 1, lab. 4, cr. 1. (Weeks 11-15).

This course will teach students how to use AutoCAD® for horticultural landscape design and construction applications.

HORT 22400 Photoshop Applications in Horticulture Sem. 2. Class 1, Lab 4, cr. 1. (Weeks 1-5).

This course will teach students how to use Adobe® Photoshop® software for horticultural applications.

Undergraduate Level/Upper-Division Courses

HORT 30100 Plant Physiology Sem. 1. Class 3, lab. 2, cr. 4. Prerequisite: BIOL 11000 or BTNY 21000 or (BIOL 13100 and BIOL 13200) and (CHM 25500 or CHM 25700 or CHM 26200).

Basic physiological processes of higher plants, particularly as related to the influence of environmental factors on growth, metabolism, and reproduction. Laboratory experiments involve hands-on experience with numerous aspects of plant physiology, including water relations, photosynthesis, growth, dormancy, hormones, and flowering.

HORT 30600 History of Horticulture Sem. 2. Class 3, cr. 3.

The origins and development of agriculture, with specific emphasis on horticulture from prehistory to the present in relation to civilization and modern culture.

HORT 31000 Planting Design Basics Sem.1. Class 2, lab. 2, cr. 1 (Weeks 6-10)

An introduction to the principles and methods of design and graphic communication as applied to the arrangement of plants in the landscape. The focus will be on small scale, ornamental and educational display plantings. Both herbaceous and woody planting design examples for public gardens, golf courses and other public sites will be presented.

HORT 31500 Landscape Design Sem. 1. Class 2, studio 4, cr. 3. Prerequisite: HORT 22200, HORT 22300, and HORT 22400.

An introduction to landscape design process. The focus will be on smaller sites, constructed site systems and planting design. Graphic skills will emphasize techniques for drawing site plans and other illustrations.

HORT 31600 Landscape Construction Sem. 2. Class 2, studio 4, cr. 3. Prerequisite: HORT 31500.

An introduction to the primary elements and systems of the constructed landscape, including landform, edging, paving, retaining wall, decking, low-voltage lighting, irrigation, drainage and ornamental water systems.

HORT 31700 Landscape Contracting and Management* Sem. 1. Class 2, lab. 2, cr. 3. Prerequisite: HORT 21700.

Principles and practices applicable to the installation and management of landscape plants. Topics include site and project assessment, site modification and plant installation, the business practices of estimating and bidding, and plant management.

HORT 36000 Flower Arrangement and Indoor Plant Management Sem. 1 and 2. Class 2, lab. 2, cr. 3.

Principles of flower arrangements and displays. Identification, culture, propagation, and use of plants for indoor plantings. Laboratory materials fee required.

HORT 37000 Professional Floral Design Sem. 1. Class 2, lab. 3, cr. 3. Prerequisite: HORT 36000.

Principles and techniques of commercial-scale floral design for weddings, funerals, hospitals, personal, and parties. Design construction for fresh, dried, and silk materials. Survey of retail florist management.

HORT 39000 Cooperative Program in Horticulture Sem. 1 and 2. SS. Cr. 0. Consent of departmental cooperative program coordinator required.

Supervised work experience in horticultural industry. Programs must be preplanned and conducted under the direction of the departmental coordinator with the cooperation of an employer. Students must submit a summary report.

HORT 40000 Horticulture Study Abroad Sem. 1 and 2. SS. Credit 0–8. May be repeated for credit.

Utilized to record credits earned through participation in Purdue study abroad programs with cooperating foreign universities.

HORT 40300 Tropical Horticulture Sem. 1. Class 3, cr. 3.

An introduction to the agriculture of the tropics and subtropics, emphasizing horticultural crops. Offered in even-numbered years.

HORT 42000 Ornamental Plant Production Sem.1. Class 3, cr. 3.

HORT 42300 is an intensive study of specific production technologies used to commercially grow landscape and floriculture crops, including greenhouse and nursery management. The course will have an emphasis on the growth and development of major floral and nursery crops as influenced by the environment and cultural techniques. Class trips required. Students will pay Individual lodging or meal expenses when necessary.

HORT 42100 Fruit Production Sem. 1. Class 2, lab. 2, cr. 3.

This course will teach the science and practice of temperate fruit production with emphasis on pome fruit (apples, pears), stone fruit (peaches, plums, cherries), berry crops (strawberries, brambles, blueberries) and grapes. Principles and concepts will be an important part of the class integrating knowledge of plant physiology, biochemistry and post-harvest physiology. This course will emphasize sustainable production practices and prepare students to think critically to solve fruit production problems.

HORT 42200 Vegetable and Herb Production Sem. 2. Class 2, lab. 2, cr. 3.

Sustainable principles, practices, establishment, production, maintenance and harvesting of vegetable crops.

HORT 42500 Landscape Horticulture Capstone Project Sem. 1 and 2. Class 1, studio 4, cr. 3. Corequisite: Enrolled in Landscape Horticulture and Design major.

Individuals or teams of students will work with local governments, community service agencies, or not-for-profit organizations on projects in which students address problems of landscape planting design, landscape installation, and/or landscape management. The supervising faculty advisory committee will identify projects. Under the mentorship of the advisory committee, students will work closely with the sponsoring client entity to define the problem and participate in creating and/or implementing solutions. At project completion, oral presentations will be made to clients to supplement a written project report. Open only to graduation candidates majoring in Landscape Horticulture and Design.

HORT 43500 Principles of Marketing and Management for Horticultural Businesses Sem. 1. Class 3, lab. 2, cr. 4. Prerequisite: AGEC 20300 or AGEC 21700; AGEC 33000 or ENTR 20000.

Principles of marketing and business management in the horticultural industries; market organization, performance, and planning; financial planning, pricing, promotion, cost control, and legal aspects of retailing. Case studies in direct farm, floral, and garden center management.

HORT 44000 Public Garden Management Sem. 1 and 2. Class 1, cr. 1. Prerequisite: HORT 21700 and an approved internship.

Based on an approved internship at a public garden, arboretum, or other public horticulture-related institution, students will explore management strategies used by the host institution and then submit a comprehensive report. A computer-aided oral presentation based on specific aspects of the internship program will also be required.

HORT 44200 Sustainability in the Managed Landscape Sem. 2. Class 1, cr. 1. Course enrollment is capped at 14.

Presents recent advances in the science and technology of sustainable practices for managed landscapes. This course will utilize a lecture format with a combination of presentations by the instructor, expert guest speakers, and students. Offered even number years.

HORT 44500 Strategic Analysis of Horticultural Production and Marketing Sem. 2. Class 1, cr. 1. Prerequisite: HORT 43500.

Based on an approved work experience at a commercial horticultural enterprise, students will explore the management, operational, and horticultural setting and strategies used by that enterprise and then submit a comprehensive enterprise analysis. A computer-aided oral presentation based on specific aspects of the enterprise and the student's work experience is also required.

HORT 45000 In the English Landscape: Integrating History, Horticulture and Landscape Architecture (LA 45000) SS. Cr. 3. Prerequisite: consent of instructor required.

Intensive four-weeks in residence in Corsham, United Kingdom with visits to significant sites to examine the intersections between human culture and the natural environment that results in the developed landscape. Offered in even-numbered years.

HORT 49100 Special Assignments in Horticulture Sem. 1 and 2. SS. Cr. 1–3 (el. 5 to 8 A). Prerequisite: open to limited number of students approved by instructor.

Training in research techniques, statistical methods, and record procedures. Assigned research problems. A written report of work accomplished is required.

HORT 49200 Horticultural Science Capstone Seminar Sem. 1. Class 1, cr. 1. Prerequisite: three credits of HORT 49100 and graduation candidate status.

A seminar class combining career development activities with analysis and presentations centered around relevant problems in horticulture science. Students will draw on a variety of their experiences such as undergraduate research (HORT 49100), internships, study abroad programs, and other pre-professional activities.

HORT 49900 Thesis Research Sem. 1 and 2. SS. Cr. 1–6. Prerequisite: admission to the honors program. May be repeated for credit.

For honors students doing individualized research on horticultural problems; report required. Arrange with academic advisor and honors research advisor before registering.

Dual Level/Undergraduate-Graduate

HORT 50100 Scanning Electron Microscopy: Principles Sem. 1. Class 2, cr. 1 (Weeks 1-10).

This 10-week course covers basic theory of Scanning Electron Microscopy and its use as a technique for scientific research. The intent of the course is to provide students with a basic foundation of SEM for evaluating literature and utilizing the technique for their research. This is a pre- or co-requisite for HORT 50200, the practical applications course required for independent use of the facilities of the Life Science Microscopy Center (LSMF).

HORT 50200 Scanning Electron Microscopy: Application Sem. 1. Lab 6. cr. 2 (Weeks 1-10) Consent of instructor required. Prerequisite or corequisite: HORT 50100. Arrange hours.

This is a 10-week course covering application of Scanning Electron Microscopy (SEM) and its use as a tool for scientific research. The intent of the course is to train students to conduct independent research using this technology and the facilities of the Life Science Microscopy Facility (LSMF).

HORT 50300 Transmission Electron Microscopy: Principles Sem. 2. Class 2, cr. 1 (Weeks 1-10).

This 10-week course covers basic theory and application of Transmission Electron Microscopy and its use as a tool for scientific research. The intent of the course is to provide students with a basic foundation of TEM for evaluating literature and utilizing the technique for their research. This is a pre- or co- requisite for HORT 50400, the practical applications course required for independent use of the facilities of the Life Science Microscopy Center (LSMF). This is a shared course with Biological Science (BIOL 59500).

HORT 50400 Transmission Electron Microscopy: Application Sem. 2. Lab. 6, cr. 2 (Weeks 1-10). Consent of instructor required. Pre-requisite or corequisite: HORT 50300.

This is a 10-week course covering application of Transmission Electron Microscopy (TEM) and its use as a tool for scientific research. The intent of the course is to train students to conduct independent research using this technology and the facilities of the Life Science Microscopy Facility.

HORT 51300 Nutrition of Horticulture Crops Sem. 2. Class 3, cr. 1. Prerequisite: a course in plant physiology and soil science, or consent of the instructor. Course meets during weeks 11–15.

An integrated course about plant nutrition focused on horticultural crops. The unique features of nutrient availability in a soil-less horticultural media will be highlighted. An emphasis will be placed on understanding the physiological basis of plant responses to nutrient application.

HORT 54100 Postharvest Technology of Fruit and Vegetables (FS 54100) Sem. 2. Class 3, cr. 1. Prerequisite or corequisite: an introductory course in biochemistry. Course meets during weeks 11-15.

Theoretical and applied aspects of methods being used for enhancing the quality and shelf life of harvested fruits and vegetables. Factors that affect the longevity of produce and technology used to control these factors and reduce deterioration of produce between harvest and consumption will be emphasized.

HORT 54200 (YDAE 54200) Introduction to Agricultural Biotechnology for Educators. SS. Class 3, cr. 3.

This course is offered as a distance education course to help formal and informal educators understand how transgenic organisms are produced, as well as enable them to teach science and issues surrounding agricultural biotechnology.

HORT 55100 Molecular and Cellular Plant Physiology (BIOL 55100) Sem. 1. Class 3, cr. 3. Prerequisite: an introductory course in plant physiology. Prerequisite or corequisite: BCHM 56100.

Topics include plant-water relations, membrane transport, translocation, and mineral nutrition. This course is the first in a series of team-taught courses in the core curriculum of the Purdue Plant Biotechnology Program.

HORT 55300 Plant Growth and Development (BTNY 55300) Sem. 2. Class 3, cr. 3. Prerequisite: BIOL/HORT 55100 and BCHM 56100; corequisite: BCHM 56200.

Topics include seed dormancy, cell expansion and plant growth, pattern formation, phase transition, flowering, pollination and fertilization, seed development, fruit development, and senescence. This course is the second in a series of team-taught courses in the core curriculum of the Purdue Plant Biology Program.

HORT 59000 Special Studies in Horticulture Sem. 1 and 2. SS. Cr. 1–3. May be repeated for a total of nine credits.

Special studies in horticulture not covered in regular coursework. The field in which work is offered will be indicated on the student's record.

Landscape Architecture

Undergraduate Level/Lower-Division Courses

LA 10100 Survey of Landscape Architecture Sem. 1. Class 3, cr. 3.

A general overview of the profession of landscape architecture and a description of Purdue's landscape architecture program. This course will provide entering prelandscape architecture and landscape horticulture-design students a preview of the profession that they have chosen to pursue and will be a general information course for students across the campus who have an interest in becoming familiar with landscape architecture.

LA 11600 Graphic Communication for Students of Landscape Architecture and Design Sem. 1. Class 1, lab 4, cr. 3.

Introduction to design and presentation techniques fundamental to landscape architecture. Short projects give students exposure to a variety of presentation materials (pencil, ink, pastel, watercolor and acrylic, paper and board) to freehand lettering, and to two- and three-dimensional illustrations. Materials used are purchased by the student.

LA 11700 Computer Technology in Design Sem. 2. Class 1, lab. 4, cr. 3.

An introductory course that covers the computer technology skills needed to communicate, create, and implement designs in the fields of landscape architecture. The course will include current technology in the following areas: CAD, desktop publishing, image processing, GIS, spread sheet, file transfer protocol, scanning, printing, and file management.

LA 15000 Preservation Issues Sem. 1. Class 3, cr. 1.

An introduction to the preservation movement in the United States, focusing on the chronology of developments and organizational structure of the public, private, and not-for-profit sectors at the federal, state, and local levels. Course meets during weeks 1–5.

LA 15100 Building Preservation Sem. 1. Class 3, cr. 1.

Identification of architectural styles, the language of preservation, preparation of a national register application, tax credits and tax incentives for historic preservation will be covered. The student is to develop a working knowledge of the Secretary of Interior Historic Preservation Guidelines. Course meets during weeks 6–10.

LA 15200 Community Preservation Sem. 1. Class 3, cr. 1.

Downtown revitalization using historic preservation as an economic development strategy will be presented. The unit focuses on the roles of the National Main Street Center, Indiana Main Street Center, federal, state, and local legislative initiatives and local historic districts, guidelines, and local historic review boards. Course meets during weeks 11–15.

LA 16600 History and Theory of Landscape Architecture Sem. 2. Class 3, cr. 3.

A study of the historic evolution of landscape architecture to the status of a recognized profession. The course covers the social, economic, political, climatic, and other factors that have influenced the development of design styles and theories.

LA 17600 Urbanization and Change in the Midwest Landscape Sem. 2. Class 2, cr. 2.

This course traces the evolution and meaning of the human-made Midwest environment from the retreat of the Wisconsin glacier to the present. The course intertwines economic, cultural, historical, political, technological, anthropological, and social data to develop a working model of change in the Midwestern environment.

LA 22700 Planting Design I Sem. 1. Class 1, studio 4, cr. 3. Prerequisite: LA 216; corequisite: HORT 21700, or consent of instructor.

Review of design principles as related to plant design characteristics; design implications of plant responses to environment; review of landscape plants in fall.

LA 25000 Architectural Design Sem. 2. Class 3, cr. 1. .

Basic theory in the design of structures, uses of architectural materials, interior-exterior circulation patterns and arrangement of space, and architectural presentation. Course meets during weeks 1-5

LA 26600 Frank Lloyd Wright Sem. 2. Class 2, cr. 2.

The course is an overview of the architecture, philosophy, and biographical background of one of America's foremost architects, Frank Lloyd Wright. The lectures explore his prolific output of architectural commissions along with his efforts at community planning, furniture design, textile design, and related arts. LA 266 provides a broad overview of American architecture through a survey of Wright's predecessors, mentors, peers, and his antagonists. The course includes two field trips, one to Oak Park, Illinois, the community featuring the largest number of built works by Wright, and to the John E. Christian residence, 'Samara' in West Lafayette.

Undergraduate Level/Upper-Division Courses

L A 30900 Coop Preparation Sem. 2. Class 2, cr. 1.

The material presented in this course consists of a broad overview of the employment opportunities in the professional practice of landscape architecture and the ways secure an internship. It provides the student with information about career choices in landscape architecture and an appropriate knowledge base with which to make informed internship choices. Students prepare written and graphic documents for seeking employment. Students prepare for interviews and communications leading to employment as an intern in landscape architecture.

LA 32500 Planting Design II* Sem. 1. Class 1, studio 4, cr. 3. Prerequisite: HORT 21700, LA 21600 and LA 22700.

Study of plants as unique elements of landscape design. Plants will be studied for their aesthetic and functional uses in the landscape. Various scales of planting and design will be approached. Natural distribution and ecological considerations in planting design will be explored.

LA 39000 Professional Cooperative Programs in Landscape Architecture Sem. 1 and 2. SS. Cr. 0. Consent of cooperative program coordinator required.

Supervised work experiences in landscape architectural offices and in the landscape construction or maintenance industry. Programs must be preplanned and conducted under the direction of the cooperative educational coordinator in cooperation with an employer. Students must submit a summary report of the work experience.

LA 40000 Landscape Architecture Study Abroad Sem. 1 and 2. SS. Credit 0–8. May be repeated for credit.

Utilized to record credits earned through participation in Purdue study abroad programs with cooperating foreign universities.

LA 42600 Capstone Course in Landscape Architecture Sem. 2. Class 2, lab 6, cr. 5. Prerequisite: LA 41600 and graduation candidate status.

This course will focus on the integration and applications of the accumulated knowledge of landscape architecture from the student's previous coursework and internship experiences. Students will be challenged to identify and solve problems in community-based projects. The students will also communicate, through reports and presentations, their

results and plan to community audiences, faculty, and other students. Students will also do directed readings and then discuss topics related to the current and future practices of landscape architecture and environmental design.

LA 45000 In the English Landscape: Integrating History, Horticulture and Landscape Architecture (HORT 45000) SS. Cr. 3. Prerequisite: Consent of instructor required. Offered in even-numbered years.

Intensive four-weeks in residence in Corsham, United Kingdom with visits to significant sites to examine the intersections between human culture and the natural environment that results in the developed landscape.

LA 47600 Professional Practice of Landscape Architecture* Sem. 1. Class 2, cr. 2. Prerequisite: LA 32600 and 35600.

A study of the principles and practice of landscape architecture in private and public offices. The course covers project acquisition, office management, and project implementation procedures. Preparation of a professional compendium is required.

LA 48000 Landscape Architecture Seminar Sem. 2. Class 1, cr. 1.

Exploration and discussion of current problems in the environmental design profession. Student presentation of selected landscape architectural problems.

LA 49000 Special Problems in Landscape Architecture Sem. 1 and 2. SS. Cr. 1–6.

Independent in-depth study and presentation of specific research or design problems selected by the student in consultation with the instructor. Open only to advanced students.

LA 49900 Thesis Research Sem. 1 and 2. SS. Cr. 1–6. Prerequisite: admission to the honors program. May be repeated for credit.

For honors students doing individualized research on landscape architecture; report required. Arrange with academic advisor and honors research advisor before registering.

Landscape Architecture Design Studies

General studies for the development of problem-solving methodologies and graphic techniques applicable to a wide variety of professional landscape architectural projects. These projects, during a six-semester design sequence, may include residential, industrial, and recreational projects; school and college campuses; subdivision and housing developments; highway alignment and beautification; shopping centers; historical restoration; and urban problems. The projects increase in complexity as the sequence progresses.

LA 21600 Landscape Architectural Design I* Sem. 2. Class 1, studio 4, cr. 3. Prerequisite: LA 11600.

Landscape architectural site design, an introduction into processes and products. Building on the introduction to graphics in LA 11600, this is an introduction to the processes and production of site design and development drawings. Recording, conceptualizing, and presenting site design ideas through problem solving projects. Emphasis on hand and computer drafting and drawing skills to communicate design ideas.

LA 22600 Landscape Architectural Design II* Sem. 2. Class 2, studio 4, cr. 4. Prerequisite: LA 21600.

Methods, principles, and the process of designing in the built environment. Basic principles of site organization and composition are presented and applied in a series of exercises and studio projects. Role of the design process is reinforced both as a problem-solving tool and as a means of creativity and ideation.

LA 31600 Landscape Architectural Design III* Sem. 1. Class 2, studio 6, cr. 5. Prerequisite: LA 22600; corequisite: LA 34600.

Design theory and meaning of landscape architecture. Past, current, and emerging design theories are investigated via lectures, research assignments, and studio projects. Projects gain in size, complexity, and depth of meaning. Emphasis on the role theory plays both as a stabilizing force and as a catalyst for change.

LA 32600 Landscape Architectural Design IV* Sem. 2. Class 2, studio 8, cr. 5. Prerequisite: LA 31600 and 34600.

Community planning and design. Past, current, and emerging planning theories are investigated via lectures, research assignments, and studio projects. The interrelationship of land use, circulation, and open space are explored using environmental and sustainable principles within a framework of traditional neighborhood design.

LA 41600 Landscape Architectural Design V* Sem. 1. Class 2, studio 9, cr. 5. Prerequisite: LA 32600 and 35600.

Understand issues, develop concepts, and implement ideas beginning with research and precedents in urban design, which is then applied to the planning and design of complex urban sites, and resolved through detailed site design. Urban design will focus on the relationship and interaction between development patterns and land uses; access circulation and parking; and open space.

Landscape Architecture Site Systems

General studies for the application of problem-solving techniques in site planning, with emphasis on materials selection, earthwork, construction planning, and implementation. Projects include all scales of land development and increase in complexity in concurrence with the landscape architecture design studies.

LA 24600 Site Systems I* Sem. 1. Class 2, studio 4, cr. 4. Prerequisite: LA 21600.

Properties of hardscape materials, their methods of detailing and specification. Introduction to masonry, wood and site furnishings. Design of pavements, walls, steps, ramps, and other common site elements. Standards and methods of detailing and notation are presented in small-format exercises.

LA 34600 Site Systems II* Sem. 1. Class 1, studio 4, cr. 3. Prerequisite: LA 21600 and 24600.

Earthwork, grading, surface drainage, and storm water management. Properties of contour lines and topographic representation. Standards for grading practices, notation, and nomenclature. Methods of calculating volumes of cut and fill. Methodology for horizontal and vertical alignment of roads and trails.

LA 35600 Site Systems III* Sem. 2. Class 2, studio 4, cr. 4. Prerequisite: LA 34600.

Methods and standards of construction documentation using current technology. Preparation and packaging of site-related technical drawings and bid packages. Methods for site layout and dimensioning. Organization and composition of planting plans, plant lists, grading plans, lighting plans, and associated detail sheets. Standards and sequence of site-related specification documents.

Natural Resources and Environmental Science

Undergraduate Level/Lower-Division Courses

NRES 20000 Introduction to Environmental Careers Sem. 2. Class 1, cr. 1.

The course offers an introduction to general developments and practices in the environmental arena. A presentation of environmental careers and aspects of those careers that may affect job satisfaction and commitment is the main focus of the course. Included is an overview of coursework that benefits particular careers. The course is designed to introduce students to the specialized environmental areas in which they may choose to work.

NRES 23000 Survey of Meteorology (EAS 22100) Sem. 1 and 2. Class 3, cr. 3.

An introductory course for both science and non-science students. A general study of the atmosphere, basic meteorological principles, and weather systems. Relationships of the changing atmosphere to climate, ozone depletion, and other contemporary issues.

NRES 25500 Soil Science (AGRY 25500) Sem. 1 and 2. Class 1, rec. 1, lab. 3, cr. 3. Prerequisite: CHM 11200 or CHM 11600.

Differences in soils; soils genesis; physical, chemical, and biological properties of soils; relation of soils to problems of land use and pollution; soil management relative to tillage, erosion, drainage, moisture supply, temperature, aeration, fertility, and plant nutrition. Introduction to fertilizer chemistry and use. Not available to students who have taken AGRY 270.

NRES 28000 Hazardous Waste Handling Sem. 2. Class 3, lab. 3, cr. 3.

This course satisfies the OSHA standards for completion of the 40-hour Hazardous Waste Operator/Emergency Response Technician certification, 29CFR1910.120. The course includes a 35 hours laboratory component that presents hands-on field exercises and a supervised environmental project. The environmental project provides the on-the-job experience required by OSHA for full certification. The course provides students with the information they need to protect themselves and others at the job site and gives students experience in making decisions, performing tasks, and using the equipment they will encounter in the environmental workplace. Course meets during weeks 1-10.

NRES 29000 Introduction to Environmental Science (AGRY 29000, EAS 11300) Sem. 1. Class 3, cr. 3.

An introduction to environmental science, including issues such as air and water pollution, toxic waste disposal, soil erosion, natural hazards, climate change, energy resources, and environmental planning. Includes extensive in-class discussion of case studies.

Undergraduate Level/Upper-Division Courses

NRES 30500 Environmental Decision-Making Sem. 2. Class 3, cr. 3.

This course will discuss alternative ways of looking at environmental problems and assist the student with incorporating good science into a decision-making framework.

NRES 38000 Hazardous Waste Certificate Renewal Sem. 2 Cr. 0. Prerequisite: NRES 28000.

Meets OSHA requirements for the annual 8 hours Hazardous Waste Operator/Emergency Response Technician (HAZWOPER) (29CFR 1910.120) refresher course. The course was developed to update students' knowledge in making decisions, performing tasks, and using the equipment they will encounter in the environmental work place. Students successfully completing the course objectives will earn the OSHA 8 hours HAZWOPER Annual Renewal certification.

NRES 38500 Environmental Soil Chemistry (AGRY 38500) Sem. 1. Class 3, lab. 3, cr. 4. Prerequisite: (AGRY 25500 or NRES 25500, or AGRY 27000) and (CHM 11200 or CHM 11600).

Designed as an upper level introductory course covering environmental soil chemistry concepts in the framework most applicable to inorganic and organic chemical contamination of soil and water resources and intended for students in environmental science fields that may not have a strong chemistry or and/or mathematics background.

NRES 40000 Natural Resources and Environmental Science Study Abroad Sem. 1 and 2. SS. Cr. 0–8. May be repeated for credit.

Utilized to record credits earned through participation in Purdue study abroad programs with cooperating foreign universities.

NRES 45000 Soil Conservation and Water Management (AGRY 45000) Sem. 1. Class 2, lab. 3, cr. 3. Prerequisite: AGRY 25500 or NRES 25500 or AGRY 27000.

Principles of soil conservation with emphasis on control of soil erosion by wind and water; impact of soil management decisions on environment; soil-water-plant relations, includes agronomic aspects of water management for both irrigation and drainage.

NRES 49700 Natural Resources and Environmental Science Seminar Sem. 1. Class 1, cr. 1 (el. 7).

Weekly discussion on assigned topics in natural resources and environmental science, employment-related areas, and interviewing skills.

NRES 49800 Individual Studies in Environmental Science Sem. 1 and 2. SS. Cr. 1–3. Prerequisite:

An opportunity for upper-level undergraduates to focus their interests and knowledge on an environmentally related problem. Arrangements must be made with a Natural Resources and Environmental Science Program faculty member before registration.

Dual Level/Undergraduate-Graduate

NRES 58500 Soils and Land Use (AGRY 58500) Sem. 2. Class 2, lab. 3, cr. 3. Prerequisite: a soils course or a geology course.

Soils as a resource in development planning; soil properties affecting land use; use of soil survey, aerial photos, topographic maps, and other resource data in land-use allocation; non-engineering aspects of site selection for various land uses, water conservation, waste disposal, and erosion control.

Youth Development and Agricultural Education

Undergraduate Level/Lower-Division Courses

YDAE 15200 Agricultural Communication Seminar Sem. 1. Class 3, cr. 3.

This course provides an introduction to agricultural communication as a professional field, including its current status and role within the larger U.S. mass media system. The course will also provide an overview of career options and professional skills and competencies required of agricultural communicators.

YDAE 24000 Seminar in Agricultural Education Sem. 1 and 2. Class 1, cr. 1. May be repeated for credit.

Development of an understanding of the origin, scope, and objectives of agricultural education; role of the agricultural science and business teacher as a professional educator; basic responsibilities of a teacher of agricultural science and business; and significance of legislation affecting agricultural education.

YDAE 29000 Special Problems in Youth Development and Agricultural Education Sem. 1 and 2, and SS. Individual Study. Cr. 1-6. Permission of instructor required.

Open primarily to freshman and sophomores who desire to study special problems in agricultural communications, agricultural education, life science education, extension education, leadership education or youth development not covered in regular coursework. To be arranged with the instructor or departmental representative prior to registering. Repeatable to a maximum of six credits.

Undergraduate Level/Upper-Division Courses

YDAE 31800 Coordination of Supervised Agricultural Experience Programs Sem. 1. Class 3, cr. 3.

Record keeping skills and supervisory skills needed to advise and coordinate supervised agricultural experience programs of secondary agricultural science and business students. Integration of supervised agricultural experiences with programming in youth organizations and classroom instruction for secondary agricultural sciences and business classrooms.

YDAE 31900 Planning Agricultural Science and Business Programs Sem. 2. Class 3, cr. 3.

Development of course content plans that coordinate and utilize agricultural science and business, community resources, FFA, and supervised agricultural experience programs.

YDAE 35900 Leadership in Developing the Agricultural Professional Sem. 1 and 2. Class 3, cr. 3.

Leadership skills that enhance effectiveness of the agricultural professional. Students develop leadership skills through course activities and content that concentrate on team building, understanding communicating, time management, motivational skills, and goal setting.

YDAE 38500 Urban Service-Learning Sem. 1 and 2. Class 1, experiential 3, cr. 2-3. Intended for general student body. May be repeated for up to nine credits.

Using service learning as a pedagogy, students will have the opportunity to deepen and expand classroom learning through thoughtful, collaborative engagement with community organizations, agencies, and/or educational institutions and the people they serve. This course will offer opportunities to engage complex real-world problems and to test the efficacy of disciplinary and interdisciplinary approaches to finding solutions.

YDAE 40000 Agricultural Education Study Abroad Sem. 1 and 2. SS. Credit 0-8. May be repeated for credit.

Utilized to record credits earned through participation in Purdue study abroad programs with cooperating foreign universities.

YDAE 44000 Methods of Teaching Agricultural Education Sem. 1. Class 2, lab. 4, cr. 3. Prerequisite or corequisite: EDCI 20500 and EDCI 28500 and EDPS 23500 and EDPS 26500 and YDAE 31800 and YDAE 31900. Must be admitted to teacher education program.

Principles and procedures for teaching agricultural science and business in public schools.

YDAE 44100 Field Experience in Agricultural Education Programs Sem. 1 and 2. Experiential, cr. 1-3. May be repeated for credit.

The faculty have approved multiple configurations for this course. For a given session, a course will use one of the configurations listed. Check the schedule of classes to see how this course is offered for a given session.

YDAE 46000 Agricultural Publishing Sem. 1 and 2. Class 2, lab. 2, cr. 3. Prerequisite: COM 25200.

Learning experiences in all phases of agricultural publishing, including audience analysis, generating story ideas, researching, interviewing, writing, editing, photography, page design, desktop publishing, printing specifications and estimates, and distribution.

YDAE 48000 Agricultural Communication Capstone Seminar Sem. 1. Class 3, cr. 3. Prerequisite: COM 25200 and senior standing.

Prepares graduating students for entry to the workplace, assesses and enhances their communication knowledge and skills, and provides project experiences that will demonstrate their ability to communicate scientific and technical information through a variety of media. Projects will include student presentations and magazine-style articles on issues of concern to agricultural and general audiences; and a final project that requires students to conceive and create a Web site that uses converging media to communicate effectively a topical issue.

YDAE 49000 Special Problems Sem. 1 and 2. SS. Cr. 1-6. May be repeated for credit.

Open to undergraduates who desire to study special problems in agricultural communications, agricultural education, or youth development not covered in regular coursework. To be arranged with the instructor or departmental representative prior to registering.

YDAE 49100 Special Topics in Youth Development and Agricultural Education Sem. 1 and 2. SS. Arrange hours. Cr. 1-3. Prerequisite: Must be approved by instructor prior to registration. May be repeated for credit.

YDAE 49700 Thesis Research Sem. 1 and 2. SS. Cr 1-6. May be repeated for credit.

For Honors students only doing specialized youth development and agricultural education research. Arrange with academic advisor and honors research coordinator before registering.

YDAE 49900 Special Problems in Agricultural Communication Sem. 1 and 2. SS. Cr 1-3. Prerequisite: instructor approval is required. May be repeated for up to six credits.

Application of principles of mass communication in the production of agriculturally related news, feature, and magazine articles, radio and television reports, photographs, and publications in the Department of Agricultural Communication Service.

Dual Level/Undergraduate-Graduate

YDAE 54000 Program Development in Agricultural and Extension Education Sem. 1. Cr 3. May be repeated for credit up to a total of 6 credits.

Application of principles of agricultural and extension education. Emphasis on program development, supervised experience programs, and effective organization of an agricultural and extension education program.

YDAE 54200 (HORT 54200) Introduction to Agricultural Biotechnology for Educators SS. Class 3, Cr 3.

This course is offered as a distance education course to help formal and informal educators understand how transgenic organisms are produced, as well as enable them to teach science and issues surrounding agricultural biotechnology.

YDAE 55500 Principles of Extension Education Sem. 2. Class 3, cr 3.

An overview of the origin, scope, function, objectives, and organization of the cooperative extension service, including a thorough analysis of the work of the extension educator and career opportunities.

YDAE 56500 (EDCI 56500) Principles of Adult Education Sem. 2. SS. Class 3, cr 3.

Principles of adult education applied to helping adults learn, evaluating their performance, and determining their needs. Examines history, philosophy, and research of adult education. Explores techniques required in design and delivery of instruction for adults.

YDAE 56600 Conflict Management in Agricultural and Extension Education Sem. 1. Class 3, cr 3.

An examination of the theory and practice of conflict management. Particular emphasis is given to the formal public educational system and the nonformal extension education system. Through case studies of public and private controversies, students analyze conflicts and problem-solve courses of action. Through in-class and out-of-class assignments, students synthesize the conflict management literature and apply theory to current issues and topics in education and extension.

YDAE 59000 Special Problems Sem. 1 and 2. SS. Cr 1–6. Must be approved by instructor prior to registration. May be repeated for credit.

Open to graduate students and qualified undergraduates who desire to study special problems in agricultural communications, agricultural education, or youth development not covered in regular coursework.

YDAE 59100 Special Topics Sem. 1 and 2. SS. Cr 1–4. May be repeated for credit.

Specialized topics not covered in other courses. Topics, requirements, and credits to be determined yearly. Course may be repeated by a student when different topics are taught.

YDAE 59500 Internship in Agricultural and Extension Education Sem. 1 and 2. SS. Cr 1–10. Must be approved by instructor prior to registration. Amount of credit to be determined by the nature and extent of the assignment. May be repeated for credit.

A special course designed to provide practical field experience under professional supervision in selected situations related to the student's area of specialization.