AVMT306  Alt (2)
**Aircraft Non-metal Structures**
A study of wood and fabric as used in the construction of aircraft and a study of the methods, tooling, inspection, processes, and repair of composite aircraft structures. Includes the application, identification, and functions of aircraft protective finishes. Spring

AVMT308  Alt (2)
**Aircraft Assembly, Rigging and Inspections**
Study of the nomenclature and design features of both fixed-wing and rotor-wing aircraft and the assembly, alignment of aircraft structures, and rigging and balancing of control system. A detailed inspection of the entire aircraft or rotorcraft is covered as it applies to the airframe 100-hour and other required inspection. Spring

AVMT310  Alt (4)
**Gas Turbine Engines**
Principles and theory of jet-engine propulsion, design, types of, and associated systems. Maintenance, overhaul, installation-removal, repair, trimming, and troubleshooting of turbine engines. Fall

AVMT314  Alt (3)
**Aircraft Propellers and Engine Inspections**
Theory and limited work on propellers, both wood and metal. Encompasses fixed, adjustable, controllable, feathering, reversible, and the control of the latter by mechanical, hydromatic, or electrical control systems. The inspection practice of performing the 100-hour inspection on aircraft engines and propellers. Spring

AVMT316  Alt (7)
**Reciprocating Engine Systems and Overhaul**
A study of reciprocating engine theory, overhaul methods, and practices and the installation of reciprocating engines. Also includes a study of the following engine systems: exhaust, cooling, induction, and lubrication. Spring

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**AGRICULTURE**

Smith Hall, Room 109
(269) 471-6006
FAX: (269) 471-3009
agri@andrews.edu
http://www.andrews.edu/COT/AG

**Faculty**
Thomas N. Chittick, Chair
Stanley Beikmann
Katherine Koudele
Ralph C. Wood

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**Programs**

**Bachelor of Science.** The BS degree prepares individuals to pursue advanced degrees for careers in teaching or research. Students may major in agriculture, animal science or horticulture with a minor to complement their intended purpose.

**Bachelor of Technology.** The BT degree is a career specialist’s degree. Graduates are prepared for supervisory and management positions in production agriculture, horticulture, or the ornamental horticulture industry.

**Associate of Technology.** The two-year AT degree programs provide students with adequate skills and working knowledge to apply for entry-level positions in their area of specialization.

**BS: Agriculture**

**Major requirements—40**
AGRI118, 206, 300, 304, 308, 405; ANSI114; HORT105, plus 15 major elective credits chosen in consultation with advisor.
Cognate requirements—18
BIOL165,166; CHEM131, 132

BS: Animal Science
Major requirements—40
AGRI405; ANSI114, 305, 425, plus 19–21 credits in a special area of emphasis and 7–11 major electives chosen in consultation with an advisor.
Cognate requirements—18
BIOL165, 166; CHEM131, 132

Animal Science Areas of Emphasis
Students may choose an area of emphasis from the following or develop a personalized program in consultation with their advisor to meet specific career goals.

Pre-Veterinary Medicine—21
AGRI137(2); ANSI340 (1 species), ANSI379, 420, 435, 440 and 445
Recommended electives for entry into veterinary college:
* BCHM421, 422; CHEM231, 232; MATH166, 167; PHYS141, 142.
* Courses may vary depending on entrance requirements of the veterinary college of choice.

Management—19
AGRI137 (2), 395; ANSI340 (2 species); ACCT121; ECON226. Electives can be tailored to meet a specific student’s interest, such as animal behavior, business management or marketing, journalism, or communication.

BS: Horticulture
Major requirements—40
AGRI118, 240, 308, 405; HORT105, 378, plus 18 credits in a special area of emphasis and 1 credit major elective.
Cognate requirements—18
Select credits from BIOL165, 166; BOT430, 475; ZOOL459; CHEM131, 132.

Horticulture Program Emphases in BS Degree Programs
Students may choose an area of emphasis from the following or develop a personalized program in consultation with their advisor to meet specific career goals.

Landscape Design—18
Select from the following: HORT135, 226, 228, 315, 350, 365, 375, 429, 448

Landscape/Turf Management—18
Select from the following: HORT135, 208, 211, 212, 217, 226, 228, 315, 346, 350, 359, 360, 367, 417

BT: Agribusiness
Major requirements—44
AGRI118, 206, 240, 300, 304, 308, 405; ANSI114; HORT105, 378; plus 12 major elective credits chosen in consultation with advisor.
Cognate requirement—4
CHEM110
Business Emphasis—18
ACCT121, 122; BSAD341, 355; ECON226; FNCE317

BT: Horticulture
Major requirements—60
AGRI118, 240, 308, 405; HORT105, 135, 226, 228, 315, 346, 378, plus 17–18 credits in a special area of emphasis, and 7–8 major elective credits chosen in consultation with advisor.
Cognate requirement—4
CHEM110

Horticulture Areas of Emphasis in BT Degree Programs
Students may choose an area of emphasis from the following or develop a personalized program in consultation with their advisor to meet specific career goals.

Landscape Design—16
HORT350, 365, 375, 429, 448. The landscape design program emphasizes the development of technical drawing skills, an understanding of the principles of design, and a knowledge of plant material.

Landscape/Turf Management—17
HORT208, 211, 217. Select 9 credits from the following: HORT12, 350, 359, 360, 367, 375, 417. The landscape management emphasis features proper horticultural practice, identification of landscape plants, selection of appropriate equipment, and the concept of total maintenance.

AT: Agriculture
Major requirements—25-36
ANSI114, 305, 340, plus 15-24 credits in a special area of emphasis (see below) and 1–2 major elective credits chosen in consultation with advisor.

Agriculture Program Emphasis in Associate Degree Programs
Students may choose an area of emphasis from the following or develop a personalized program in consultation with their advisor to meet specific career goals.

Crop Production—24
AGRI118, 206, 240, 300, 395; HORT105
Cognate requirement—4
CHEM110

Dairy Herd Management—25
AGRI270, 304, 395; ANSI250, 278, 430, 440
Cognate requirements—4
CHEM110

Veterinary Assistant—15
AGRI395; ANSI240, 379, 420
Cognate requirements—15
CHEM110; CLSC101, 102, 230, 250, 260

AT: Horticulture
Major requirements—35
AGRI118, 405; HORT105, plus 13–16 credits in a special area of emphasis (see below) and 8–11 major elective credits chosen in consultation with advisor.
Cognate requirement—4
CHEM110
Horticulture Program Emphases in Associate Degree Programs

Students may choose an area of emphasis from the following or develop a personalized program in consultation with their advisor to meet specific career goals.

Landscape Design—13
HORT135, 226, 228, 350

Landscape/Turf Management—16
HORT208, 211, 217, 226, 228, 346

Minors in Agriculture, Animal Science or Horticulture—20
Selected from AGRI, ANSI or HORT courses in consultation with advisor.

Pre-Professional Program in Veterinary Medicine
Katherine Koudele, Director
(269) 471-6299

Entrance requirements vary among the colleges of veterinary medicine. Therefore, interested students must write to the schools of choice for the most current and detailed information. A list of accredited colleges of veterinary medicine may be obtained from the American Veterinary Medical Association, 930 North Meacham Road, Schaumburg, IL 60196; http://www.avma.org.

Students in consultation with their advisors in the Agriculture Department can design individualized programs of study to meet the entrance requirements of the veterinary school of choice. The required prerequisite pre-veterinary courses are usually general biology, general and organic chemistry, physics, biochemistry, mathematics, courses in animal science, and general education.

Courses

See inside front cover for symbol code.

AGRICULTURE

AGRI100 College Success Seminar
A survey of the history of agriculture in the U.S. and career opportunities in production agriculture, animal science, landscaping and related areas. Students also learn how to improve their study skills and become familiar with the academic resources available to them on campus. Fall

AGRI118 Soil Science
Factors affecting soil formation, soil texture, particle size, pore space and their impact on soil air/water relations, and chemical characteristics of soils, including pH, ion exchange, and maintenance of soil fertility. Weekly: 3 lectures and a 3-hour lab. Spring

AGRI137 Practicum in
Fifty hours per credit of supervised practical experience in one area of concentration. May be repeated in different areas for a maximum of 6 credits. Topics to be chosen in consultation with an advisor. Fall, Spring

AGRI206 Farm Machinery
Selection and operation of farm equipment, based on the initial cost and economic performance, including factors governing the site and type of farm machines, their capacity, efficient use, adjustment and repair. Weekly: 2 lectures and a 3-hour lab. Fall

AGRI240 Fundamentals of Irrigation
Design, installation, drawing, interpretation and maintenance of plastic or metal irrigation systems and control devices for proper sprinkler coverage. Fall

AGRI270 Management of Agriculture Enterprises
An introduction to acquiring and analysis of management information for decision making; an understanding of basic economic principles that impact biological production systems and implementation of the principles for total quality management for increased productivity. Fall

AGRI300 Field Crop Production
Importance, distribution, economic adaptation, and botany of leading farm crops, emphasizing rotation, seedbed preparation, and economic production. Spring

AGRI304 Forage Crop Production
Basic principles of forage crop production, emphasizing choice of crop, establishment, growth, maintenance, harvesting, storage, feeding, and other management decision. Spring

AGRI308 Principles of Weed Control
Control of weeds in horticultural and field crops, utilizing biological, cultural, mechanical, and chemical practices. Class study also involves preparation and testing for pesticide applicator’s license. Weekly: 2 lectures and a 3-hour lab. Fall

AGRI345 Topics in
A class based on selected topics of current interest in agriculture. Repeatable in different areas.
Concepts of International Agriculture
International Ag Implementation
Horse Judging
Livestock Judging
Viticulture
Solanaceous and Vine Crops
Tree Fruit Production

AGRI395 Internship in
Supervised internship of on-the-job work experience in some field of agriculture under the direction of the employer and evaluated by a departmental faculty member. Students submit report of their experience and must complete a minimum of 120 hours of work experience for each credit earned.

AGRI405 Research Seminar
Research work in agriculture and related fields; reports given by students, faculty, and visiting lecturers. Spring
AGRI499  (1-5)
Project in ________
Individual research in some field of agriculture under the direction of the staff. Repeatable to 10 credits.

ANIMAL SCIENCE

ANSI114  (3)
Introduction to Animal Science
Basic farm animal anatomy, reproductive and digestive physiology, housing, health management with information on how animal products are processed and marketed. Efficient, effective management is emphasized throughout course. Fall

ANSI240  $ Alt (4)
Fundamentals of Veterinary Clinical Techniques
Topics covered and skills learned include (not limited to) animal restraint and handling, anesthesia, surgical instruments and aseptic technique, surgical assistance, post-surgical nursing, pain management, wound management and bandaging, euthanasia and client bereavement, diagnostic imaging. Laboratory included.

ANSI250  $ Alt (3)
Dairy Facilities
A study of various types of milking systems, housing and manure handling systems of dairy cattle of all ages and production levels. Ventilation, stall and barn dimensions, and bedding will be some of the topics covered. Weekly: 2 lectures and one 3-hour laboratory. Summer

ANSI278  $ Alt (3)
Dairy Health and Disease
A study of the cause, prevention and treatment of infectious and metabolic diseases of dairy cattle. Weekly: 2 lectures and one 3-hour laboratory. Spring

ANSI305  $ Alt (3)
Animal Nutrition
Principles of digestion, absorption, metabolism of feeds by farm species are examined for practical, profitable feeding. Common and non-traditional feedstuffs, feed-related diseases and ration formulation are included. Weekly: 3 lectures. Recommended: CHEM110 or 131. Fall

ANSI325  $ Alt (3)
Domestic Animal Behavior
A study of the ways domestic animals communicate and interact with conspecific and other animals, and humans. Included are: physiological basis and development for each type of behavior; normal and aberrant behavior manifestations in each domestic animal species; treatments for problem situations; consideration of the effects of domestication on each species. Two lectures and one lab per week. Fall

ANSI435  Alt (3)
Animal Genetics
A study of basic genetics, cytogenetics, immunogenetics, population genetics and quantitative genetics, biotechnology, gene mapping and the use of molecular tools to research inherited disorders. Included are descriptions of how veterinary genetics can be applied to artificial selection in animal production, information on the control of inherited disorders and the conservation of genetic diversity in both domesticated and wild animal species. Three lectures per week. Spring

ANSI340  $ (3)
Production/Management of ________
Production methods and management practices of domesticated livestock species including nutrition, reproduction, housing, health and specialized care of a particular species. Course is repeatable for study of avian, beef cattle, dairy cattle (includes a lab), equine (includes a lab), porcine, and wool and lamb production. Fall, Spring

ANSI379  Alt (2)
Small Animal Health and Disease
A survey of proper handling and care, nutritional needs, and common health problems of companion animals such as dogs, cats, and birds. Fall

ANSI420  $ Alt (4)
Canine Gross Anatomy
Study of macroscopic skeleton, muscles, internal organs, blood vessels and nerves using preserved, latex-injected specimens. Comparisons made with the live dog through palpation. Weekly: 2 lectures and 2 three-hour labs. Recommended: BIOL166. Fall

ANSI425  Alt (3)
Issues in Animal Agriculture, Research and Medicine
Study of the ethical issues that challenge animal researchers, producers, caretakers, and veterinarians to treat animals humanely yet effectively in society today. Spring

ANSI430  Alt (2)
Lactation Physiology
Anatomy and physiology of the udder, milk secretion, disease prevention and treatment, milking management and milking systems.

ANSI440  $ Alt (3)
Animal Reproduction
Study of anatomy and physiology of farm animal reproduction, which explores the cellular component as well as the management aspects. Weekly: 2 lectures and a 3-hour lab. Recommended: BIOL166. Spring

ANSI445  $ Alt (3)
Physiology of Farm Animals
Physiology of digestive, reproductive, lactation, cardiovascular, pulmonary, excretory, nervous, and skeletomuscular systems in domesticated ruminants and monogastrics. Weekly: 2 lectures and a 3-hour lab. Recommended: BIOL166. Fall

HORTICULTURE

HORT105  $ (5)
Plant Science
Intended to acquaint students with the requirements of plant growth and development. Understanding of these processes is gained by studying topics such as plant cells, tissue, and organ structure; photosynthesis, cellular respiration, plant reproduction, including flowering, fruit development, seed set, the role of hormones, and plant nutrition. Weekly: 4 lectures and a 3-hour lab. Fall

HORT135  $ (4)
Landscape Drafting and Design
Develops proficiency in technical drafting for landscape design including symbols, title blocks, plant legends and plan organization. Principles of design, site analysis, functional diagraming, circulation, spatial planes, design schematics and plant selection are explored. Laboratory puts the design process to work in drawing plans for residential design. Weekly: 3 lectures and a 3-hour lab. Fall
HORT208 $ Alt (3)
Propagation of Horticultural Plants
Intended to acquaint students with the processes of asexual reproduction, especially as it applies to the horticultural industry. Asexual reproduction investigates methods of clonal reproduction utilizing non-flowering plant parts such as cutting, grafting, layering, and micropropagation (tissue culture). Weekly: 2 lectures and a 3-hour lab. Recommended: HORT105. Spring

HORT211 $ Alt (2)
Landscape Equipment
Assessment of and exposure to current equipment needed to run a landscape installation and maintenance business. Experience in physical operation of equipment, preventative maintenance and minor repair is practiced. Weekly: 1-hour lecture and a 3-hour lab. Fall

HORT212 $ Alt (3)
Floriculture Production
Intended to acquaint students with the production and uses of bedding and potted plants. Topics covered include seed physiology and propagation, germination, production and post-production growing techniques, growing media and containers. Weekly: 2 lectures and a 3-hour lab. Spring

HORT217 Alt (3)
Turfgrass Management
Principles of turfgrass management for parks, grounds, golf courses, and athletic fields. Topics include cool and warm season genera, growth and adaptation criteria, cultural considerations including irrigation, mowing, soil fertility, compaction and drainage; thatch, plant protection (weeds, insects, diseases) establishment and renovation. Fall

HORT226 Alt (3)
Woody Plant Identification
Introduction to the identification and recognition of shape, size, color, texture, environmental requirements and landscape value of common deciduous and evergreen trees, shrubs and vines. Fall

HORT228 Alt (3)
Herbaceous Plant Identification
Identification and recognition of shape, size, color, texture, and environmental requirements of the nonwoody plants providing color and ground cover in the landscape. Fall

HORT315 $ (4)
Landscape Construction
Course combines weekly hands-on construction processes of installing softscapes and hardscapes with an understanding of the vast array of hardscape materials available in the form of pavements, edgings, fencing, retaining walls, decks, pool shelters, etc. Weekly: 3 hours lecture and 3 hours lab. Spring

HORT346 $ Alt (2)
Landscape Administration and Maintenance
Administration of a landscape business, employment and supervision of employees and record-keeping practices explored. Managing maintenance of hardscapes and softscapes in residential landscapes, parks, golf courses and corporate environments. Focuses on training in pruning, planting, cultivation and pest management. Weekly: 4 hours of lecture/lab. Fall

HORT350 Alt (3)
History of Landscape Design
A study of landscape history throughout civilization and its impact upon society and the environment. The origin of landscape architectural styles and their characteristics will be explored. An introspective look at personalities of landscape designers through the ages and their influence upon the American landscape. Spring

HORT359 $ Alt (3)
Greenhouse Environment and Construction
Controlling the plant environment to enhance plant growth and optimal development through temperature, humidity, light, nutrients, sanitation and carbon dioxide levels. Structures, coverings and mechanical systems used are explored to produce the most cost-effective horticultural crops. Weekly: 2 hours lecture and a 3-hour lab. Fall

HORT360 $ Alt (3)
Arboriculture
Care of shade and ornamental trees living under environmental stress of urbanization, their legal protection and value. Includes tree anatomy and physiology, soils, nutrition and water relationships, transplanting, disease and insect control, mechanical injury and pruning to develop a healthy tree. Weekly: 2 lectures and a 3-hour lab. Fall

HORT365 $ Alt (3)
Urban Landscape Design
Designing landscapes to meet the environmental challenges and conditions of urban spaces. Circulation patterns for conducting business, aesthetic and functional aspects of design for corporate/institutional, governmental agencies and municipal areas. Weekly: 2 lectures and a 3-hour lab. Recommended: HORT135. Spring

HORT367 Alt (3)
Golf Course Supervision
Management and culture for modern golf courses and country clubs. Topics include integration of turfgrass agronomics with the administrative components of budgeting, supervision and personnel management, country club organizational structures, and design of construction and environmental issues. Golf course history, U.S. golf association rules and U.S. Golf Course Superintendents’ Association certification program will be covered. Spring

HORT375 Alt (3)
Landscape Estimating
An introduction to the estimating process for landscape design, construction and maintenance work. Various schedules and forms are used to assign costs of equipment, plants, hardscape materials, labor and overhead. The many variables from project to project are explored and then formulas are applied to arrive at making landscape installations an efficient and profitable business. Spring

HORT378 Alt (4)
Integrated Pest/Disease Management
Study of significant diseases and pests of agricultural and horticultural plant materials, including life cycles and influence of environmental conditions; determination of effective control methods for crop, ornamental and turfgrass production. Spring

HORT417 Alt (3)
Advanced Turfgrass Management
Principles of advanced turfgrass management based on turf genera, cultivar, vegetative seed identification and optimal use criteria; detailed analysis of soil fertility management and research results; development of comprehensive management plan incorporating principles of integrated pest management into a cultural
program to optimize the performance based on use systems. Use systems studied include golf courses, parks, lawns, athletic fields, bowling greens, cricket fields, and grass tennis courts. Spring

HORT429 $ Alt (3)
Computer Landscape Design
Principles and practices of computer-aided landscape design, including creating scale perimeter plot plans, using drawing tools, plant/site relationships, plant selection and use leading to a computer-generated landscape drawing. Laboratory emphasizes skill development and proficiency in integrating software and hardware to create CAD-generated landscape designs. Prior landscape drawing course work is recommended. Spring

HORT448 $ Alt (4)
Advanced Landscape Design and Graphics
Landscape design concepts relating to the more challenging problems of residential design. Field application of grading relating to contours, specifications, exploring deck design, planting combinations, and exercises in graphics and rendering for presentations. Weekly: 3 lectures and a 3-hour lab. Recommended: HORT135. Spring

ENGINEERING AND COMPUTER SCIENCE

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Gunnar Lovhoiden
Steve Ng
Nadine Shillingford
Stephen Thorman
Henock Wondem

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Undergraduate Programs

COMPUTING

Two emphases are available in Computing—Computer Science and Software Systems.

Computer Science focuses on a study of the computing as well as on its role in an application area. Areas of interest include artificial intelligence, compilers, computer architectures, computer graphics, computer networks, operating systems, program development, and analytical theory. A degree in computing with the Computer Science emphasis prepares students for graduate study, employment in computer systems/networks, administration/development, software development/maintenance, and for careers in education.

Software Systems is an applied study of computing, focusing on the development and maintenance of software in an application area. A minor in an application area is included as part of the degree. Typical minors might include one of the sciences, behavioral science, or business. Supervised “real-world” projects are a requirement for this degree. A degree in Computing with the Software Systems emphasis prepares students for employment in developing and maintaining commercial applications and for graduate studies in applied computing such as software engineering.