

AGRICULTURE

Smith Hall, Room 109
 (616) 471-6006
 agri@andrews.edu
 http://www.andrews.edu/COT/

Faculty
 Thomas N. Chittick, *Chair*
 Stanley Beikmann
 Katherine Koudele-Joslin

AVIA456
Flight Instructor Flight Training
 Teaching and analysis of maneuvers to prepare students for the FAA Flight Instructor practical test. Prerequisites: Commercial Pilot License with an Instrument Rating and AVIA455 (or corequisite).

(3) Air-carrier regulations, high altitude weather, weight and balance, jet transport characteristics, performance, and special problems in jet aircraft operations. Prepares student for the FAA written examination. Prerequisite: Instrument Rating, first-class medical certificate, and flight time requirements for the ATP Certificate.

AVIA459
Basic Ground Instructor
 Techniques of teaching aerodynamics, aircraft performance, weather, and navigation. Prepares student for the FAA written examination and to teach the Private Pilot Ground School. Prerequisite: AVIA455 or pass the FAA Fundamentals of Instruction Test.

(2) **AVIA486**
Airline Transport Pilot Flight Training
 Instrument procedures, in-flight maneuvers, take-offs, landings, advanced aircraft systems, and emergency procedures. Repeatable to 8 credits to complete requirements for both single and multi-engine airplanes. Prerequisites: First-class medical certificate and flight time requirements for the ATP. Corequisite: AVIA485.

Academic Programs	Credits
BS: Agriculture	60
BS: Animal Science	90
Pre-Veterinary Medicine Management	
BS: Horticulture	86
Fruit and Vegetable Production	
Greenhouse Operation	
Landscape Design	
Landscape Management	
Turfgrass Management	
BT: Agriculture	90
BT: Horticulture	90
Fruit and Vegetable Production	
Greenhouse Operation	
Landscape Design	
Landscape Management	
Turfgrass Management	
AT: Agriculture	58
AT: Horticulture	60
Fruit and Vegetable Production	
Greenhouse Operation	
Landscape Design	
Landscape Management	
Turfgrass Management	
Minor in Agriculture	30
Pre-Professional Program in Veterinary Medicine	

AVIA464
Advanced Ground Instructor
 Techniques of teaching, advanced aircraft systems, advanced aerodynamics, weight and balance, and performance charts. Prepares student for the FAA written examination and to teach the Commercial Pilot Ground School. Prerequisite: AVIA455 or pass the FAA Fundamentals of Instruction Test.

(2) **AVIA490**
Special Problems in Aviation
 Investigation of problems in ground and/or flight training not covered by formal courses. Permits qualified student to pursue individual study under the direction of a faculty member. Prerequisites: Permission of student's adviser and the department chair. Repeatable to 8 credits.

AVIA465
Instrument Flight Instructor Ground School
 Techniques of teaching instrument flight, analysis of instrument maneuvers and approaches, enroute operations, and lesson planning. Prepares student for the FAA Instrument flight and ground instructor written examinations. Prerequisites: Commercial certificate with Instrument Rating.

(3) **AVIA495**
Independent Study
 Enabling students to pursue topics in Aviation not offered in other scheduled courses. Prerequisite: permission of department chair and instructor. Repeatable to 8 credits.

AVIA466
Instrument Flight Instructor Flight Training
 Teaching and analysis of attitude instruments, instrument approaches, and enroute operations. Prepares student for the FAA practical test. Prerequisite or corequisite: AVIA465.

AVIA467
Multi-Engine Flight Instructor
 Teaching and analysis of maneuvers and procedures for the multi-engine airplane. Prepares student for the FAA practical test. Prerequisite: AVIA307 or Multi-Engine rating.

AVIA469
Instrument Ground Instructor
 Techniques of teaching, advanced weather theory, weather reports and forecasts, instrument procedures and regulations, approaches, and enroute operations. Prepares student for the FAA written examination. Prerequisite: AVIA465 or pass the FAA Fundamentals of Instruction Test.

AVIA474
Techniques of Mission Flying
 Develops special skills required in mission air operations: pilotage, navigation, low-level operations, terrain flying, mountain passes and canyons, cargo drops, short fields, uphill and downhill operations on primitive airstrips, maximum performance techniques, precision aircraft control. Prerequisites: Commercial Pilot and Instrument Rating.

AVIA476
Topics in _____
 Repeatable with different topics in aviation technology. Prerequisites depend on subject.

AVIA485
Airline Transport Pilot Ground School

Programs

Bachelor of Science. The BS degree prepares individuals to pursue advanced degrees for careers in teaching or research. Students may major in agriculture with a minor to complement their intended purpose or complete a 90-credit major in horticulture.

Bachelor of Technology. The BT 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

Major requirements—90

AGRI115, 214, 305, 405, 425 plus 36-41 credits in a special area of emphasis and 33-38 major electives chosen in consultation with an adviser.

Cognate requirements—27

BIOL155, 156, 157; CHEM121, 122, 123

Animal Science Areas of Emphasis

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

Pre-Veterinary Medicine—36

AGRI137, 340 (3 species), 379, 421, 422, 440, 445. Recommended electives for entry into veterinary college: *BCHM401, 402; CHEM211, 212, 213; MATH162; PHYS151, 152, 153.

*Courses may vary depending on entrance requirements of the veterinary college of your choice.

Management—41

ACCT111; AGRI137, 321, 340 (5 species), 498; 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—86**

AGRI105, 106, 115, 116, 117, 240, 308, 321, 368, 369, 405 plus 20-38 credits in a special area of emphasis.

Cognate requirements—31

BIOL155, 156, 157, 371; CHEM121, 122, 123. See *Horticulture Emphases below*.

BT: Agriculture**Major requirements—90**

AGRI105, 106, 115, 116, 117, 206, 214, 240, 300, 304, 305, 308, 321, 395, 405, plus 28 major elective credits chosen in consultation with adviser.

Cognate requirements—8

ACCT111; CHEM111

BT: Horticulture**Major requirements—90**

AGRI105, 106, 115, 116, 117, 240, 308, 321, 368, 369, 395, 405, plus 20-41 credits in a special area of emphasis, and 3-24 credits major elective credits chosen in consultation with adviser.

Cognate requirements—8

ACCT111; CHEM111

Horticulture Areas of Emphasis

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

Fruit and Vegetable Production—20

AGRI315, 345 (Marketing Horticultural Crops and Pest Management in Vegetable Production—8 credits), 348, 349.

Greenhouse Operation—26

AGRI208, 221 or 222, 227, 228, 229, 260, 370. The greenhouse operation program is designed to provide entry-level skills for supervisory positions in large greenhouse operations as well as management of small retail greenhouse operations. Emphasis is placed on crop production and marketing

of crops.

Landscape Design—41

AGRI125, 209, 221, 222, 224, 228, 350, 355, 365, 409, 429. 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 Management—37

AGRI208, 209, 211, 217, 221, 222, 224, 228, 350, 360. The landscape management emphasis features proper horticultural practice, identification of landscape plants, selection of appropriate equipment, and the concept of total maintenance.

Turfgrass Management—34

AGRI209, 211, 217, 221, 222, 224, 360, 367, 417. The turf industry encompasses the establishment and maintenance of turfgrass areas for parks, golf courses, and recreation fields.

AT: Agriculture**Major Requirements—58**

AGRI105, 106, 115, 116, 117, 206, 214, 240, 300, plus 24 major elective credits chosen in consultation with adviser.

Cognate requirements—5

CHEM111

AT: Horticulture**Major requirements—60**

AGRI105, 106, 115, 116, 117, 240, 405, plus a program emphasis (see below) and 3-15 major elective credits chosen in consultation with adviser.

Cognate requirements—5

CHEM111

Horticulture Program Emphases in Associate Degree Programs

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

Greenhouse Operation—22

AGRI208, 227, 229, 260, 370. In addition, students should select one plant ID class from AGRI221, 222, 228 (2 credits).

Landscape Design—22

AGRI125, 209, 221, 222, 224, 228, 355

Landscape Management—26

AGRI208, 209, 211, 217, 221, 222, 224, 228

Turfgrass Management—32

AGRI209, 211, 217, 221, 222, 224, 360, 367, 417

Minor in Agriculture—30

Selected from AGRI courses in consultation with adviser.

Pre-Professional Program in Veterinary Medicine

Katherine Koudele-Joslin, Director (616) 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. *Students in consultation with their advisers 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

(Credits)

See inside back cover for symbol code.

ANIMAL SCIENCE**AGRI214 (4)****Animal Science**

Basic farm animal anatomy, reproductive and digestive physiology, housing, and health management with information on how animal products are processed and marketed. Efficient, effective management emphasized.

AGRI305 \$ (4)**Animal Nutrition**

Dietary requirements of livestock with the objective of correlating health and production with nutrition. Includes ration formulation for practical and profitable feeding. Weekly: 3 lectures and 1 lab. Prerequisite: AGRI214.

AGRI340 (4)**Production/Management in _____**

Production methods and management practices of domesticated livestock species with an emphasis on nutrition, reproduction, housing, health, and care of the relevant species. Repeatable with topics like avian, beef cattle, dairy cattle, equine, porcine, and wool and lamb production. Prerequisite: AGRI214.

AGRI345 (1-4)**Topics in _____**

Repeatable with areas such as

Wildlife and Fisheries

Study of the care, management, and diseases of wildlife and aquatic animal life including animals housed in zoos and conservation parks.

AGRI379 (3-4)**Small Animal Health and Disease**

Surveys proper handling and care, nutritional needs, and common health problems of hand-held pets including dogs, cats, and birds.

AGRI380 \$ (4)**Horse Judging and Evaluation**

Principles of evaluating horses and communicating reasons for preferences through oral and written presentation. Practical experience incorporated when possible.

AGRI385 \$ (4)**Livestock Judging**

Principles and practice of evaluating livestock for selection as producers of meat, milk, and fiber. Practical experience incorporated when possible.

AGRI421 \$ (4)**Canine Gross Anatomy I**

Study of macroscopic skeleton, skeletal muscles, heart, and lungs with the associated blood vessels

and nerves using preserved, latex-injected specimens. Comparisons made with the live dog through palpation. Weekly: 3 lectures and 3 hours lab. Prerequisite: BIOL157.

AGRI422 \$ (4)
Canine Gross Anatomy II

A continuation of AGRI421 with emphasis on the abdominal and pelvic cavity contents and the head. Weekly: 3 lectures and 3 hours lab. Prerequisite: AGRI421.

AGRI425 (4)
Issues in Animal Research, Agriculture, and Medicine

Study of the ethical issues that challenge animal researchers, producers, caretakers, and veterinarians to treat animals humanely yet effectively in society. Students research some aspect of this subject and present their findings.

AGRI430 (4)
Lactation Physiology

Microscopic and macroscopic anatomy of the udder, both normal and pathological. Includes the biochemistry and physiology of milk synthesis and cellular secretion as well as endocrine and environmental influences. Prerequisites: AGRI214; BIOL157.

AGRI440 \$ (4)
Animal Reproduction

Study of anatomy and physiology of farm animal reproduction which explores the cellular component as well as the management aspects. Weekly: 3 lectures and 3 hours lab. Prerequisites: AGRI214; BIOL157.

AGRI445 (4)
Physiology of Farm Animals

General principles of digestive, reproductive, cardiovascular, pulmonary, excretory, nervous, and skeletomuscular systems in domesticated ruminants and monogastrics. Prerequisites: AGRI214, BIOL157.

CROPS AND SOILS

AGRI116 \$ (4)
Physical Properties of Soils

Factors affecting soil formation and classification and the impact of organic matter, particle size, soil texture, pore space, and density relationships on soil aeration and water management. The use of artificial amendments for preparing growing media for greenhouses and nurseries emphasized. Weekly: 3 lectures and 3 hours lab.

AGRI117 (4)
Chemical Properties of Soils

Identification of elements required in plant nutrition, their sources, and factors affecting availability—acidity and salinity—in the context of ion exchange and transfer to root systems. Discussion of methods for evaluating soil fertility, fertilizer application, and the economics of plant nutrient use.

AGRI300 Alt (4)
Field Crop Production

Importance, distribution, economic adaptation, and botany of leading farm crops, emphasizing rotation, seedbed preparation, and economic production.

AGRI304 Alt (4)

Cereal and Forage Crops

Production of small grains, corn, hay, pasture, and silage crops.

AGRI315 (4)
Viticulture

Studies the structure and function of the grapevine, and the cultural practices employed to establish and maintain vineyards, including fertilization, pruning, training, insect and disease control, and vineyard floor management.

AGRI345 (1-4)
Topics in _____
Repeatable in such areas as
Agricultural Marketing

Greenhouse Construction

Structures, coverings, and mechanical systems used to create the optimum greenhouse environment to produce the most cost-effective plant-growing conditions for commercial horticultural crops. Weekly: 3 lectures and 3 hours lab.

AGRI315 (4)

Viticulture

A study of the structure and function of the grapevine, cultural practices employed to establish new vineyards as well as maintaining mature vineyards, including fertilization, pruning, training, insect and disease control, and vineyard floor management.

AGRI321 Alt (4)

Management of Agricultural Enterprises

Organization and management of agricultural enterprises including units of production, power, and equipment, use of records, and marketing factors affecting management.

AGRI349 (4)

Tree Fruit Production

An introduction to modern tree fruit production discussing site selection and varieties and root stock selection, and emphasizing modern cultural practices that culminate in increased yields and lower production costs and marketing of tree fruit crops.

AGRI350 (4)

History of Landscape Design

A study of landscape history through civilization as an outgrowth of architectural design and its impact upon society and the environment. The origin of landscape architectural styles, principles, and elements are explored, and an introspective look taken at landscape designer personalities through the ages and their influence upon the American landscape.

AGRI355 \$ (4)

Landscape Site Design

Concentrates on landscape accessories and hardscapes (curbing, sidewalks, driveways, terraces, pools, walls, fences). Lab includes practice in creating specification plans for hardscapes. Weekly: 3 lectures and 3 hours lab.

AGRI358 \$ (1-4)

AGRI467 (4)
Concepts of International Agriculture
 A study of the relative significance of the role of external institutions and agencies, financial programs for agricultural development, human resource development, and agricultural education as a means of fostering worldwide agricultural development.

AGRI468 (4)
International Agricultural Implementation
 The application of scientific agricultural principles of food production, utilizing cultural practices based on appropriate agricultural technologies that support a philosophy of sustainability for future generations.

AGRI498 (1-6)
Internship
 Field practicum on site.

AGRI499 (1-5)
Project in _____
 Individual research in some field of agriculture under the direction of the staff. Repeatable to 10 credits.

ENGINEERING, COMPUTER SCIENCE, AND ENGINEERING TECHNOLOGY

Haughey Hall, Room 312
 (616) 471-3420; FAX: (616) 471-3797
 johnsonr@andrews.edu
 http://www.andrews.edu/COT/

Faculty
 Ronald L. Johnson, *Acting Chair*
 Gerald W. Coy
 Glenn E. Johnson
 Gunnar Lovhoiden
 Roberto Ordonez
 James Wolfer

A BS degree with a concentration in Industrial and Operations Engineering is offered entirely on the Andrews campus. This program prepares students to use analytical methods in the design of efficient production and service systems, and for either employment or graduate study. Electives may be chosen to place emphasis on health-care systems or production industries.

Professional Engineering

(first two years)

Required courses to be taken during the two years at Andrews: CHEM121, 122, 123; COMM104; COSC161; ENGL111, 112; ENGR120, 135, 225, 281, 282; MATH171, 172, 173, 281, 282, 283; MECT121, PHYS251, 252, 253, 261, 262, 263; Religion (8 credits); Social Studies and Humanities (8 credits).

Minor in Engineering

Required courses—30
 ENGR120, 225, 281, 282 or 300; plus 16-17 credits of engineering electives (may include ELCT152 and 172, 153 and 173, 204, 224, 324, 340, 385; MECT121, 386.

BS: Industrial and Operations Engineering

Major requirements—70
 BSAD355; ECON225, 226; ENGR120, 135, 225, 281, 282, 465; INDT320, 410, 440, 450, 460; MECT121; plus 16 credits selected from BSAD 436, 440; COSC162, 163, 436; ENGR224; INSY448; MATH401, 402, 427; MECT155; TCED254, 456.

Cognate requirements—63
 MATH171, 172, 173, 281, 282, 283; CHEM121, 122; COSC161; STAT251; PHYS251, 252, 253, 261, 262, 263.

MSA with Engineering Management Emphasis

See graduate programs for the School of Business, p. 156.

COMPUTER SCIENCE

For information on the BS in Computing with options in Computer Science and Software Systems, and the MS in Software Engineering, see the supplement to the bulletin.

Academic Programs	Credits
BS in Computing with options in Computer Science and Software Systems	
BS: Industrial and Operations Engineering	70
BS in Engineering Program	
First two years on Andrews campus and final two years at Walla Walla College, College Place, WA	
BSET: Computer Engineering Technology	60
BSET: Electronics Engineering Technology	60
Biomedical Electronics Technology	
Industrial Electronics Technology	
BSET: Mechanical Engineering Technology	60
BSIT: Electronics Technology	60
BSIT: Production Systems	60
AET: Computer Engineering Technology	40
AET: Electronics Engineering Technology	40
AET: Mechanical Engineering Technology	40
Minor in Electronics	30
Minor in Engineering	30
MS in Software Engineering	

Programs

ENGINEERING INTEGRATED FOUR-YEAR PROFESSIONAL ENGINEERING PROGRAM

Andrews University offers the first two years of an integrated four-year professional engineering program. The final two years of the Bachelor of Science in Engineering degree program are offered at Walla Walla College (College Place, WA). Students may specialize in civil, electrical, or mechanical engineering. The department at Andrews University may assist students by coordinating a program with another engineering school upon request.

ENGINEERING TECHNOLOGY

Engineering technology—the area of the technological employment spectrum between the engineer and the skilled craftsman—includes both the engineering technician (Associate of Engineering Technology) and the engineering technologist (Bachelor of Science in Engineering Technology).

Industrial technology—the portion of the technological employment spectrum between the skilled craftsman and management—combines the development of a technical skill with courses in industrial management.

SEQUENCE OF TWO-YEAR AND FOUR-YEAR PROGRAMS