COLLEGE OF TECHNOLOGY

M. Wesley Shultz, *Dean*
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ASSOCIATE DEGREE GENERAL EDUCATION REQUIREMENTS

General Education course requirements for the Associate in Engineering Technology and the Associate of Technology degrees are as follows:

	AET	AT
Religion	**8**	**8**
RELB100		
One of the following: RELB210, 225, RELP400, RELT250, 340		
Arts and Humanities	**4-6**	**3-4**
or		
Social Sciences		
Selected from HIST115, 116; IDSC211, 212, 237; PSYC101; SOCI119; ANTH200; GEOG110; PLSC104; ECON225.		
Physical/Natural Sciences	**12**	**0**
PHYS151, 152, 153		
Language and Communication		
ENGL111	**3**	**3**
COMM104	**3**	**3**
Mathematics and Computer Science		
MATH106		**4**
MATH162, 163, 165 or 171, 172	**8-12**	
INSY110		**4**
COSC125	**4**	
Wellness		
HLED130	**3**	**3**
Core		
ENGR120 **2**		
TCED125		**4**
Total credits required	**47-53**	**32-33**

BACCALAUREATE DEGREE CORE REQUIREMENTS

The BSET, BSIT, and BT core requirements are as follows:

BSET	
ENGR120	2
ELCT151, 152, 205	10
MECT185, 186, 265	9
MECT121	3
INDT450	4
AGRI395 or ENGT396 or GTEC395 or INDT315	4
BSIT	
AGRI395 or ENGT396 or GTEC395 or INDT315	4
27 credits chosen from the following two groups of courses:	27
A minimum of 12 credits selected from INDT310, 320, 410, 440, 450, 460; MECT120, 121; TCED254, 456	
A minimum of 8 credits selected from ACCT111, 112, 113; BSAD210, 341, 342, 355, 374, 415, 436; ECON226; FNCE387; MKTG310, 320, 330	
BT	
AGRI395 or GTEC395 or INDT314	4
INDT310	4

General Courses

See inside back cover for symbol code. **(Credits)**

GTEC110 **(2)**
Freshman Seminar
College success and life enrichment skills. Included are an introduction to the resources of the university, principles of critical thinking, and Christian values clarification.

GTEC115 **(2)**
College Seminar
See description under GTEC110. Repeatable to 8 credits.

GTEC298 **(1-48)**
Prior Learning Assessment
Prior Learning Assessment (PLA) is a process which validates learning experiences occurring outside traditional college/university academic programs. A portfolio of evidence for demonstrating experience and competency justifies and determines the amount of credit granted. Repeatable with different topics.

GTEC395 **(1-6)**
Cooperative Work Experience
Supervised (by the dean or his appointee) on-the-job work experience with a cooperating industry. A minimum of 150 hours of work is required per credit. The student must submit a report of the cooperative work experience as specified by the instructor. Repeatable to 6 credits. Graded S/U. Prerequisites: an associate degree in technology or equivalent and permission of the dean. Students must apply and be accepted one quarter in advance of their planned Cooperative Education experiences.

GTEC498 **(1-48)**
Prior Learning Assessment
See description under GTEC298. Total prior learning assessment credits (GTEC298 and 498) may not exceed 48 credits.

INDIVIDUALIZED PROGRAMS OF STUDY

For students who have career goals or special interests in areas other than those provided in one of the established majors or minors, a special individualized concentration is available in the following degrees: Bachelor of Science, Bachelor of Science in Engineering Technology, Bachelor of Science in Industrial Technology, Bachelor of Technology, Associate of Engineering Technology, and Associate of Technology. An individualized concentration may be planned to meet the career goals of a student. Before the beginning of the junior year for baccalaureate-degree students or the beginning of the sophomore year for associate-degree students, the student, with the assistance of his or her adviser, prepares a proposed program of study. The program must be approved by a department faculty and the College of Technology Academic Policies and Curricula Committee.

AERONAUTICAL TECHNOLOGY

Seamount Building (Airpark), Room 203
(616) 471-3548
airinfo@andrews.edu
http//www.andrews.edu/AVIA/

Faculty
Allen Bernet, *Chair*
Kevin Jacobs
Richard L. Kaping
Harry Lloyd
Gary A. Marsh

Academic Programs	Credits
BSET: Aircraft Engineering Technology	134
BSIT: Aircraft Maintenance Technology (Maintenance/Business)	115
BT: Aviation Technology	98-118
Avionics	
Flight	
Flight/Business	
Flight/Maintenance	
Maintenance	
AT: Aviation Technology	72-88
Flight	
Maintenance (84)	
Minor in Aviation Technology	30
Flight	
Maintenance	
FAA-approved Part 141/Part 147	
Aircraft Airframe	
Aircraft Powerplant	
FAA Flight School Certification Programs	
Commercial Pilot	
Flight Instructor	
Instrument Rating	
Multi-Engine Rating	
Private Pilot	

Students may choose program emphases (or a combination of them) in such areas as flight, maintenance, business, avionics, and engineering technology.

Programs

If any of the degree programs do not meet the needs of the student, an individualized major is available as described on this page.

BSET: Aircraft Engineering Technology

The BSET degree combines instruction in aviation maintenance with other engineering courses and prepares students with skills between those of an engineer and a skilled craftsman (licensed A & P Technician).

Maintenance area courses (see below)	80
Technical core	19
ELCT171, 172; MECT365, 366, 371, 372, 375	
Degree core	32
General Education requirements	91-98
Total credits for degree	**222-229**

BSIT: Aircraft Maintenance

(Maintenance and Business)

Students may combine business and maintenance. This, along with the General Education requirements, is the basis for aviation business responsibilities.

Maintenance courses (see below)	84
Degree core	31
General Education requirements	71-74
General electives	1-4
Total credits for degree	**190**

BT: Aviation Technology

Students taking the Bachelor of Technology degree may choose to combine two of the specialization options—flight, maintenance, business, and avionics—or they may combine areas (see below) to meet specific career goals or limit their specialization to a single area—flight or maintenance.

Major*	90-110
Degree core	8
General Education requirements	71
General electives	1–21
Total credits for degree	**190**

***Major Options**

Flight
- Flight—60 credits
- Aviation electives—30 credits

Flight and Business
- Flight—60 credits
- Aviation electives—8 credits
- Business—41 credits
  (*to meet pre-MBA requirements*)

Flight and Maintenance
- Flight—30 credits
- Maintenance—80 credits

Maintenance
- Maintenance—80 credits
- Flight electives—10 credits

AT: Aviation Technology

Students may earn an Associate of Technology degree by taking courses beyond those required for the certificate in either the flight or maintenance area. The additional courses give students a broader General Education base, prepare them better to perform the activities acquired by the certificate program, and facilitate study for an advanced degree.

Major*	68-84
General Education requirements	28-29
Degree core	4
Total credits for degree	**100-117**

***Majors**

Flight
- Flight—60 credits
- Aviation electives—8 credits

Maintenance
- Maintenance—84 credits

Minor in Aviation Technology

Requirements: A minimum of 30 credits in either flight or maintenance. Additional aviation electives must be approved by the department chair.

Students earn a minor in Aviation Technology by completing one of the following:

Flight (23-30 credits): AVIA105, 106, 205, 206, 305, 306. A Commercial Pilot certificate and instrument rating are required.

Maintenance: Complete either the Airframe or Powerplant License and obtain a Private Pilot License.

FAA Certification

FAA-Approved Instruction. The Department of Aeronautical Technology operates an Airframe and Powerplant Maintenance Technician School as well as a Flight School (FAA-approved under Part 141 and Part 147). Students enrolled in programs at these schools must take one religion course a year.

FAA Maintenance Certificates. Students may earn the following FAA-approved certificates from the Airframe and Powerplant Maintenance Technician School:

Aircraft Airframe
Aircraft Powerplant

FAA Flight Certification Programs. Students may take flight instruction to qualify for several levels of certification. Students wishing only to take the content courses necessary for the specific flying expertise can take just the flight area courses as outlined under the respective certification requirements.

FLIGHT AREA COURSES

Private Pilot Certificate, Commercial Pilot Certificate, Instrument Rating, and either Flight Instructor's Certificate or Multi-Engine Rating are required.

Required Courses—60

AVIA105, 106, 205, 206, 305, 306, 307 or 455, 456.

Area electives are to be chosen in consultation with an adviser and with the written approval of the department chair.

No more than 50% of the aviation flight credits to be counted toward a major or minor in aviation may be taken for credit by examination.

MAINTENANCE AREA COURSES

Maintenance students must obtain either the FAA Airframe or Powerplant license for any degree or certificate.

Required Courses—84

AVIA110, 113, 116, 120, 142, 143, 144, 145, 152, 233, 235, 237, 240, 251, 252, 253, 342, 343, 345, 351, 352, 353, and either 105 or 108.

All aviation majors pursuing a degree must take a minimum of 8 credits in aviation maintenance courses.

Courses

(Credits)

See inside back cover for symbol code.

AVIA104 **(1-4)**
Introduction to Aviation
Acquaints students with opportunities in aviation, including mission flying, flight instruction, aircraft maintenance, avionics, sales, safety, and aerodynamics of flight. Some dual flight instruction included. Not applicable toward a major.

AVIA105 **(4)**
Private Pilot Ground School
Ground instruction to prepare students for the FAA private pilot written examination. Topics include Federal Aviation Regulations, navigation, meteorology and aircraft systems, and performance. Open to all students.

AVIA106 **(1-6)**
Private Pilot Flight Training
Flight and ground instruction to prepare students for the FAA Private Pilot examination. Corequisite: AVIA105 or pass a private written examination. Open to all students.

AVIA108 **(1-6)**
Student Pilot Flight Training
Flight and ground instruction introducing the student to piloting an airplane and to the environment in which it operates. Topics include aircraft systems and performance, meteorology, and Federal Aviation Regulations. Prerequisite: AVIA104 or permission of department chair.

AVIA110 **(1-4)**
Aircraft Basic Science
Mathematics for technicians placing emphasis on practical problems encountered in aircraft maintenance. Aircraft Weight and Balance fundamentals with emphasis on weighing procedures, equipment changes, and alterations. Drawings—Study of the fundamentals of mechanical drawing. Physics—Study of aerodynamics and forces related to the aircraft industry.

AVIA113 **(2)**
Flight Line and Servicing Operations
A familiarization course in aircraft servicing. Standard procedures of ground operation, fueling, movement, and the safety precautions necessary to aircraft line operations.

AVIA116 **(2)**
Federal Aviation Regulations, Forms, Records, and Maintenance Publications
Study of Federal Aviation Agency forms, Airworthiness Directives, Regulations, Type Certificates (Production and Supplemental), Technical Standard Orders, Manufacturers Maintenance, Parts and Service Bulletins, Letters, and Instructions.

AVIA120 **(4)**
Material, Processes, Corrosion Control and Aircraft Plumbing
Introduces tools, hardware, and materials used in aircraft maintenance repair. Includes precision measurement, the processes of non-destructive testing and inspection, aircraft plumbing, aircraft cleaning, and the recognition and control of corrosion as it relates to aircraft materials.

AVIA142 **(1)**
Aircraft Protective Coatings
Development of skills in the removal and application of protective coatings and finishes such as lacquers, enamels, and epoxies.

AVIA143 **(1-4)**
Basic Electricity
Study of the fundamental basics of electricity. Areas of concentration include electrical diagrams and their computations, sources of electrical power, alternating current, aircraft storage batteries, measurement of capacitance and inductance, binary code, and the study of basic solid-state logic.

AVIA144 **(2)**
Aircraft Welding
The theory and practice of welding methods used in

aircraft construction and repair. Emphasis on weld-quality identification.

AVIA145 (2)
Aircraft Systems I (Instruments, Navigation, Communication, Ice and Rain Control Systems) A familiarization of aircraft instruments and their functions; communication and navigation equipment; de-ice, anti-ice, and rain-control systems. Includes installation, removal, and repair as allowed by Federal Regulations and the manufacturer's instructions.

AVIA152 (6)
Turbine Engines
Introduction to the basic principles of jet propulsion including Newton's laws of motion, types of turbine powerplants, turbine auxiliary and ground power units, performance characteristics, theory of operation, basic construction, maintenance, ground operation, and adjustment of turbine engines, including troubleshooting and trimming.

AVIA205 (3)
Commercial Pilot Ground School
Advanced navigation, FAR parts 61, 91, and 135 for air taxi, complex aircraft systems, weight and balance, and performance charts included to prepare students for the commercial pilot written examination. Prerequisite: AVIA105 or Private Pilot certification.

AVIA206 (3)
Commercial Pilot Flight Training
Instruction and solo flight to prepare the student for the FAA commercial pilot examination. Prerequisites: Private Pilot certificate, AVIA205 (or corequisite). Repeatable to 6 credits.

AVIA233 (4)
Aircraft Fuel and Fire Protection Systems
A study of aircraft fuels and their characteristics, along with the inspection, maintenance, repair, and troubleshooting of aircraft fuel systems and components. Includes a study of fire warning and extinguishing systems, their components, operation, service, and repair.

AVIA235 (2)
Aircraft Cabin Atmosphere Systems
Pressurization, air conditioning, heating, ventilation, and oxygen systems in aircraft.

AVIA237 (4)
Aircraft Landing Gear, Hydraulic and Pneumatic Systems
Operation and maintenance of aircraft hydraulic and pneumatic systems including the repair of components and of systems, aircraft landing gear and gear retraction-system analysis, shock-strut servicing, brake-lining replacement, and wheel and tire replacement.

AVIA240 (4)
Non-Metallic Aircraft Structures
A brief study of the use of wood structures and fabric covering in aircraft construction and the recognition of defects in each. An in-depth study of composite structures, resins, bonding methods, tool and machine usage, repairs and defect recognition.

AVIA248 (1-4)
Workshop
Provides flexibility for the occasional workshop when appropriate to offer aviation credit. Workshop requirements must be approved by the department.

AVIA251 (4)
Powerplant Fuel-Metering Systems
A study of aircraft fuel-delivery systems with emphasis on those components located on the engine side of a firewall. Basic principles of carburetion, pressure injection carburetion, and direct fuel injection including disassembly, assembly, operation, inspection, maintenance, overhaul, installation, repair, and troubleshooting of such components.

AVIA252 (4)
Powerplant Electrical and Fire Suppression
The study of various electrical systems directly related to the aircraft powerplant including generation and control of electrical power, generation of reciprocating engine ignition energy and its distribution and timing, and engine compartment fire detection and suppression. Prerequisite: AVIA143 or permission of instructor.

AVIA253 (4)
Powerplant Sub-systems (Exhaust, Cooling, Lubrication Instrument, and Induction Systems)
Includes a study of instrument systems, and the inspection, service, maintenance, and repair of engine exhaust, cooling, lubrication, induction, and supercharging systems.

AVIA254 (2-4)
Airframe and Powerplant Review
A directed review of all subjects for either the Airframe Rating, Powerplant Rating, or both. Not required for FAA Maintenance-approved curriculum.

AVIA275 (1-4)
Topics in _____
Repeatable with different topics in aviation.

AVIA295 (1-6)
Cooperative Work Experience
Work experience with an aviation organization or airline. A minimum of 150 hours of work required per credit. Graded S/U. Prerequisite: Permission of department chair.

AVIA305 (4)
Instrument Pilot Ground School
Federal Aviation Regulations, instrument flight charts, flight planning, instrument approaches—ILS, VOR, NDB; use of radar and DME, FAA, publications relating to instrument flight. Prerequisite: Private Pilot License or permission of instructor.

AVIA306 (4)
Instrument Flight Training
Instrument flight instruction for the FAA instrument rating. Prerequisites: 80 hours of flight time and Private Pilot License. Repeatable to 8 credits.

AVIA307 (2)
Multi-Engine Flight Training
Flight and ground instruction for the practical test. Dual flight instruction for the operation of a multi-engine airplane. Prerequisite: Commercial certificate or equivalent experience.

AVIA330 (1-4)
Crew Resource Management
Study of the effective use of resources available to the crew to achieve safe and efficient flight operations. Areas include human factors, communication, conflict resolution, leadership, teamwork, and situational awareness as applied to flight operations. Prerequisite: Private Pilot License or permission of instructor.

AVIA342 (3)
Aircraft Electrical Systems
Practical study of aircraft electrical systems including installation practices, repair, troubleshooting, servicing, and inspection. The function and operation principles of position warning and indicating systems are discussed. Prerequisite: AVIA143 or permission of instructor.

AVIA343 (5)
Aircraft Sheet Metal
Practical study of aircraft structural characteristics with emphasis on aluminum sheet metal applications. Explains metal-working processes and develops the techniques necessary for airworthy workmanship. Prerequisite: AVIA120 or permission of instructor.

AVIA345 (5)
Aircraft Assembly, Rigging, and Inspections
Study of the nomenclature and design features of both fixed and rotor-winged aircraft. Hoisting, jacking, and alignment of the aircraft and rigging of control surfaces are studied. The procedures and performance of aircraft inspections and conformity with aircraft specifications and airworthiness directives is pursued.

AVIA351 (4)
Propellers
Theory and practical work on propellers, both wood and metal. Encompasses fixed, adjustable, controllable, and feathering types, including manual, hydromatic, and electrical operation. Service and permissible repair procedures covered. New concepts of unducted fans are introduced.

AVIA352 (5)
Engine Overhaul I
A study of aircraft reciprocating engine theory, repair, and overhaul. The student removes and disassembles an operable aircraft engine, determines serviceability of all parts, part procurement processes in preparation for engine assembly. Engine assembly is accomplished in AVIA353.

AVIA353 (5)
Engine Overhaul II
A continuation of AVIA352—new parts are inspected for conformity and previously inspected and/or repaired parts are assembled according to the overhaul information. Engine installations, ground run and adjustments, and inspection practices conclude course. Prerequisite: AVIA352.

AVIA395 (1-4)
Practicum
Lab or on-the-job experience to build skills in a specific area of aviation technology. Repeatable to 6 credits. Prerequisite: permission of department.

AVIA455 (3)
Flight Instructor Ground School
Techniques of teaching, analysis of maneuvers, and lesson planning to prepare students for the FAA Flight Instructor written examination. Prerequisites: Commercial Pilot certificate, with Instrument Rating.

AVIA456 **(3)**
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).

AVIA459 **(2)**
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.

AVIA464 **(2)**
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.

AVIA465 **(3)**
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.

AVIA466 **(3)**
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 **(3)**
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 **(2)**
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 **(4)**
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 **(1-4)**
Topics in _____
Repeatable with different topics in aviation technology. Prerequisites depend on subject.

AVIA485 **(4)**
Airline Transport Pilot Ground School
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.

AVIA486 **(4)**
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.

AVIA490 **(1-4)**
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.

AVIA495 **(1-4)**
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.

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

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	

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 programs provide students with adequate skills and working knowledge to apply for entry-level positions in their area of specialization.

BS: Agriculture

Major requirements—60
AGRI105, 106, 115, 116, 117, 206, 214, 240, 300, 304, 305, 308, 321, 340, 405 plus 4 major elective credits chosen in consultation with adviser.
Cognate requirements—31
BIOL155, 156, 157, 371; CHEM121, 122, 123

BS: Animal Science