

and maintenance of software application programs, and requires a supporting minor in an application area.

### **BSE: Engineering**

The Bachelor of Science in Engineering degree has emphases in Electrical and Computer Engineering and in Mechanical Engineering. These two emphases build on a strong traditional mathematics, science, and engineering core. The Electrical and Computer Engineering emphasis focuses on the area of digital systems, communication systems, and computer-controlled instrumentation and computer simulation. The Mechanical Engineering emphasis focuses on the elements of mechanical design and the electromechanical elements of smart machines.

## **General Courses (Credits)**

See inside front cover for symbol code.

### **GTEC110 (3–4)**

#### ***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 (3–4)**

#### ***College Seminar***

See description under GTEC110. Repeatable.

### **GTEC298 (1–32)**

#### ***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 (1–4)**

#### ***Cooperative Work Experience***

Supervised (by the dean or his appointee) on-the-job work experience with a cooperating industry. A minimum of 120 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 semester in advance of their planned Cooperative Education experiences.

### **GTEC498 (1–32)**

#### ***Prior Learning Assessment***

See description under GTEC298. Total Prior Learning Assessment credits (GTEC298 and 498) may not exceed 32 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 program is available in the following degrees: Bachelor of Science, Bachelor of 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 advisor, 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.

# AERONAUTICS

Seamount Building (Airpark)  
(269) 471-3547  
Fax: (269) 471-6004  
airinfo@andrews.edu  
<http://www.andrews.edu/COT/aviation>  
<http://www.andrews.edu/COT/ap>

### **Faculty**

Allan R. Payne, *Chair*

James H. Doran

Duane E. Habenicht

Gary A. Marsh

Dina M. Simmons

Academic Programs	Credits
BT: Aviation Technology Flight Flight/Business Flight/Maintenance Maintenance Maintenance/Business	124–140
AT: Aviation Technology Flight (36) Maintenance (52)	62–74
Minor in Aviation Technology Flight (20) Maintenance (32)	20 or 32
Certificates Private Pilot* Commercial Pilot Instrument Rating Flight Instructor Multi-Engine Rating	
FAA-approved Part 141* FAA-approved Part 147, Maintenance Technician Airframe Powerplant Airframe and Powerplant	

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

## **Programs**

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

Two programs are available. A four-year Bachelor in Aviation Technology, and a two-year Associate in Aviation Technology. Both programs give the student beginning level skills in flight or maintenance. The airpark is located about 1.2 miles from the central campus. Students are expected to provide their own transportation to and from the airpark.

**BT: Aviation Technology**

Students taking the Bachelor of Technology degree may:

- (1) combine areas to meet specific career goals (see options that follow) or
- (2) limit their specialization to a single area—flight or maintenance.

Major*	60-90
Degree core	6
General Education requirements	39-42
General electives	17-0
<b>Total credits for degree</b>	<b>124-140</b>

**\*Major Options****Flight**

- Flight core (AFLT)—36 credits
- Flight electives (AFLT)—18–24 credits
- Departmental electives—6–0 credits

**Flight and Business**

- Flight—36 credits
- Departmental electives—4–1 credits
- Business—21 credits minimum

**Flight and Maintenance**

- Flight—36 credits
- Maintenance—52 credits

**Maintenance**

- Maintenance—52 credits
- Departmental electives—8 credits

**Maintenance and Business**

- Maintenance—52 credits
- Business—21 credits minimum

**Flight Area Courses**

A Private Pilot Certificate, Instrument Rating, and a Commercial Certificate with single and Multi-Engine Ratings are required for any BT or AT flight option.

**Required Courses—60**

AFLT115, 118, 215, 218, 305, 318, and 326

Aeronautical Technology electives are to be chosen in consultation with an advisor. These electives are added to the required core classes that make up the 60 hours required by the major.

Credit by exam will only be approved for new students transferring in with previous FAA certificates subject to departmental approval.

**Maintenance Area Courses**

A Maintenance Certificate with Airframe and Powerplant ratings is required for any BT or AT maintenance option.

**Required Courses—52**

AVMT 108, 114, 116, 120, 204, 206, 210, 220, 226, 237, 304, 306, 308, 310, 314, and 316

**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*	40–52
General Education requirements	16–22
General electives	6–0
<b>Total credits for degree</b>	<b>62–74</b>

**\*AT Options****Flight**

- Flight—36 credits
- Departmental electives—4 credits

**Maintenance**

- Maintenance—52 credits

**Minor in Aviation Technology**

**Requirements:** A minimum of 20 credits in flight or 32 in maintenance, respectively.

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

**Flight** (20 credits): AFLT115, 118, 215, 218. A Private Certificate with an instrument rating is required.

**Maintenance** (32 credits): Complete either the Airframe or Powerplant License.

**FAA Certification**

**FAA-Approved Instruction.** The Department of Aeronautical Technology operates a Flight School as well as an Airframe and Powerplant Maintenance Technician School approved by the FAA under Title 14 CFR, Part 141\* and Part 147, respectively.

\* Private curriculum only

**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.

**FAA Maintenance Certification Programs.** Students may earn the following FAA approved certificates from the department's Aviation Maintenance Technician School:

- Airframe
- Powerplant
- Airframe and Powerplant

**Courses****(Credits)**

See inside front cover for symbol code.

**Aeronautical Flight****AFLT104****(1–4)****Introduction to Aviation**

Acquaints students with the history and opportunities in aviation, such as mission flying, flight instruction, aircraft maintenance, avionics, sales, safety, and aerodynamics of flight. Non-majors receive one free flight. *Fall, Spring*

**AFLT115****(4)****Private Pilot Ground School**

Ground training to prepare students for the FAA private pilot air-

plane knowledge test. Topics include aerodynamics, weight and balance, Federal Aviation Regulations, navigation, meteorology, aircraft systems and performance. *Fall, Spring, Summer*

**AFLT118** (6)  
***Flight Training I***

Sixty-five (65) hours of aircraft and simulator time leading to the airplane Private Pilot Certificate including 10 hours of cross-country flight. *Fall, Spring, Summer*

**AFLT215** (4)  
***Instrument Pilot Ground School***

Ground training to prepare the student for the FAA instrument rating airplane knowledge test. Topics include Federal Aviation Regulations, meteorology, instrument flight charts, flight planning, instrument approaches, use of navigation equipment, and FAA publications relating to instrument flight. *Spring*

**AFLT218** (6)  
***Flight Training II***

Sixty-five (65) hours of aircraft and simulator time leading to the airplane instrument pilot rating including 25 hours of cross-country flight needed to meet the 50-hour cross-country requirement. *Fall, Spring, Summer*

**AFLT220** (3)  
***Meteorology***

Meteorology provides students with a comprehensive study of the principles of meteorology while simultaneously providing classroom and laboratory applications focused on current weather situations. It provides real experiences demonstrating the value of computers and electronic access to time sensitive data and information. *Fall*

**AFLT230** (3)  
***Aerodynamics***

The study of aerodynamic principles used in aircraft. Designed for a better understanding of basic design and devices used to improve aircraft performance. *Fall*

**AFLT305** (4)  
***Commercial Pilot Ground School***

Ground training to prepare the student for the FAA commercial-pilot airplane knowledge test. Topics include advanced navigation, FAR Parts 61, 91, and 135 for air taxi, complex aircraft systems, weight and balance, and performance charts. *Fall*

**AFLT315** Alt (3)  
***Aircraft Systems for Pilots***

The study of aircraft systems and engines, propellers and governors; the fuel, electrical, hydraulic, pneumatic, and de-icing systems, flight controls, weight and balance, and aircraft-instrument systems. *Fall*

**AFLT318** (6)  
***Flight Training III***

Sixty-five (65) hours of single-engine flight, multi-engine flight and simulator time. The course includes preparation for the Private Pilot Multi-Engine Land rating. *Fall, Spring, Summer*

**AFLT326** (6)  
***Flight Training IV***

Sixty-five (65) hours of aircraft and simulator time leading to the airplane Multi-Engine and Single-Engine Commercial ratings. *Fall, Spring, Summer*

**AFLT330** (3)  
***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. *Spring*

**AFLT455** (3)  
***Flight Instructor Ground School***

Ground training to prepare the student for the FAA flight instructor airplane knowledge test. Topics include techniques of teaching, analysis of maneuvers, and lesson planning. *Fall, Spring, Summer*

**AFLT456** (2-4)  
***Flight Instructor Flight Training***

Flight and ground training to prepare the student for the FAA flight instructor airplane practical test. Topics include the performance, teaching, and analysis of flight maneuvers required for the private and commercial airplane pilot (4 cr. for initial CFI; 2 cr. for CFI add-on). *Fall, Spring, Summer*

**AFLT464** (2)  
***Basic and Advanced Ground Instructor***

Prepares the student for the FAA basic and advanced ground instructor knowledge test. Topics include techniques of teaching aerodynamics, aircraft performance, aircraft systems, weight and balance, meteorology, navigation, and regulations. *Fall, Spring, Summer*

**AFLT465** (3)  
***Instrument Flight Instructor Ground School***

Prepares the student for the FAA instrument flight instructor knowledge test. Topics include techniques of teaching instrument flight, analysis of instrument maneuvers, instrument approaches, enroute operations, regulations, and lesson planning. *Fall, Spring, Summer*

**AFLT466** (3)  
***Instrument Flight Instructor Flight Training***

Flight and ground training to prepare the student for the FAA instrument flight instructor airplane practical test. Topics include the performance, teaching, and analysis of attitude instruments, instrument approaches, and enroute operations. *Fall, Spring, Summer*

**AFLT467** (2-4)  
***Multi-Engine Flight Instructor***

Flight and ground training to prepare the student for the FAA multi-engine airplane flight instructor practical test. Topics include the performance, teaching, and analysis of maneuvers and procedures for the multi-engine airplane (4 cr. for initial CFI; 2 cr. for CFI add-on). *Fall, Spring, Summer*

**AFLT469** (2)  
***Instrument Ground Instructor***

Prepares the student for the FAA instrument ground instructor knowledge test. Topics include the techniques of teaching advanced weather theory, weather reports and forecasts, instrument procedures and regulations, approaches, and enroute operations. *Fall, Spring, Summer*

**AFLT474** (3)  
***Techniques of Mission Flying***

Develops special piloting skills required in remote undeveloped bush operations. Topics include pilotage, dead reckoning, GPS navigation, low-level operations, terrain flying, mountain passes and canyons, cargo drops, short fields, uphill and downhill operations on primitive airstrips, maximum performance techniques, and precision airplane control. *Fall, Spring, Summer*

**AFLT485** (3)  
**Airline Transport Pilot Ground School**  
 Prepares the student for the FAA airline transport pilot knowledge test. Topics include air-carrier or air-taxi regulations, high altitude weather, advanced weight and balance, and the performance and special problems in large airplane operations. *Fall, Spring, Summer*

**AFLT486** (3)  
**Airline Transport Pilot Flight Training**  
 Flight and ground training to prepare the student for the FAA airline transport pilot airplane practical test. Topics include instrument procedures, in-flight maneuvers, take-offs, landings, advanced airplane systems, and emergency procedures. *Fall, Spring, Summer*

## Aviation Maintenance

**AVMT108** (4)  
**Applied Science for Aerospace Technicians**  
 Applies the sciences of mathematics and physics to the aerodynamics of flight, maintenance, weight and balance and various maintenance problems that the aircraft maintenance technician could encounter. Includes the study and use of drawings and basic ground operations. *Fall*

**AVMT114** (2)  
**Aircraft Basic Electricity**  
 A study of the fundamental basics of electricity and electronics; including electrical diagrams, calculations, sources of electrical power, direct and alternating current, aircraft storage batteries, capacitance and inductance, binary code and the basics of solid state logic. *Fall*

**AVMT116** (2)  
**Federal Regulations, Publications, Forms and Records**  
 Study of the federal regulations and manufacturer publications as they apply to aircraft design, maintenance, inspections, forms and records, and the certification and privileges/limitations of the aviation maintenance technicians. *Fall*

**AVMT120** (4)  
**Materials and Processes for Aircraft Structures**  
 Includes hand and power tool usage, aircraft hardware and materials, precision measurements, corrosion control, non-destructive testing, and fluid lines and fittings. *Fall*

**AVMT204** Alt (2)  
**Aircraft Electrical Systems**  
 Practical study of aircraft electrical systems, including installation practices, repair, troubleshooting, service, and inspections. *Spring*

**AVMT206** Alt (4)  
**Powerplant Electrical Systems**  
 A study of engine ignition and engine electrical systems (starter, generators, alternators, auxiliary electrical power units and their control circuits, engine instruments, and engine fire protection-suppression systems). *Spring*

**AVMT210** Alt (4)  
**Aircraft Systems**  
 An in-depth study into the inspection, repair, checking, servicing and troubleshooting of the following aircraft systems; ice-and-rain detection, cabin atmosphere (pressurization, heating, cooling, and oxygen), position warning systems, navigation and communication systems, and aircraft instruments and their use in troubleshooting of aircraft systems. *Spring*

**AVMT220** Alt (2)  
**Aircraft Fuels and Fuel Systems**  
 A study of the various types and handling of fuels used in aircraft. Includes a study of aircraft fuel systems, fuel metering methods and the inspection, checking, servicing, troubleshooting, repair and overhaul of fuel systems and their components, and fire detection and protection. *Spring*

**AVMT226** Alt (2)  
**Engine Fuel Metering Systems**  
 A study of the engine side of the fuel systems (firewall forward). Includes an in-depth study of fuel-metering devices used on aircraft engines (carburetors, pressure carburetors, direct and continuous fuel-injection systems). Service, maintenance, repair and troubleshooting of each different system type is covered in detail. *Spring*

**AVMT228** (1-3)  
**Maintenance: General, Airframe, or Power Plant Review**  
 A review of all subjects from a selected curriculum. A minimum of five examinations per curriculum area is required. Prerequisites: All applicable curriculum subjects must have been completed. *Fall, Spring*

**AVMT237** Alt (4)  
**Aircraft Hydraulic, Pneumatic, and Landing Gear Systems**  
 Operation and maintenance of aircraft hydraulic systems, pneumatic systems, landing-gear systems, and the inspection, checking, servicing, trouble-shooting, and repair of these systems and system components. *Spring*

**AVMT304** Alt (4)  
**Aircraft Metal Structures**  
 A study and application of the processes used in the fabrication and repair of aircraft metal structures. Welding theory and practice with emphasis on weld-quality identification. Riveted, aircraft, aluminum, sheet-metal structures including the fabrication and repair of such structures. *Fall*

**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*
- Technology**
- TECH140** \$ (2)  
**Welding Technology**  
 Oxyacetylene and electric welding processes including oxyacetylene welding, cutting, and brazing; basic shielded metal arc welding and basic gas metal arc welding. A limited amount of out-of-position welding will be stressed. *Fall*
- TECH250** \$ (3–4)  
**Machine Shop**  
 Basic set-up and operation of lathes, milling machines, grinders, drilling machines, and shapers; safety, machine maintenance, off-hand grinding, drill sharpening, layout, and inspection emphasized. *Spring*
- TECH254** (3)  
**Technical Space Utilization**  
 Acquaints students with the planning and organization of technical facilities. Consideration given to space requirements, building structure, material flow, equipment needs, site location, and environment control of such facilities. *Spring*
- TECH285/485** (1–4)  
**Project Course**  
 Development of a skill in a given area of technology under the supervision of the instructor. Repeatable to 12 project credits. Prerequisite: Permission of instructor. *Fall, Spring*
- TECH275/475** (1–4)  
**Topics in \_\_\_\_\_**  
 Repeatable with different topics in aviation. *Arranged*
- TECH294** (1–3)  
**Cooperative Work Experience**  
 Work experience with an aviation organization or airline. A minimum of 120 hours of work required per credit. Graded S/U. Prerequisite: Permission of department. *Arranged*
- TECH295/495** (1–2)  
**Independent Study**  
 Enables students to pursue topics in aviation not offered in other scheduled courses. Prerequisite: Permission of the department. Repeatable to 4 credits. *Arranged*
- TECH315** (3)  
**Succeeding in the Workplace**  
 Focus on the development of attitudes, performance and communication that will assist in making the transition from the classroom to the workplace an enjoyable and profitable experience. *Fall*
- TECH370** (3)  
**Technical World and Man**  
 Gives students a general understanding of how modern technologies affect society. Topics include how humans respond to technological change, the social consequences of technology, and technological issues in national decisions. *Spring*
- TECH390** (1–4)  
**Internship**  
 On-the-job internship experience for those students seeking industrial experience which cannot be simulated in a classroom setting. A range of 120–150 clock hours of work are required for each credit. Selected in consultation with the student's advisor. May be repeated.
- TECH395** (1–4)  
**Practicum**  
 Lab or on-the-job experience to build skills in a specific area of technology. Prerequisite: Permission of department. Repeatable to 6 credits. *Arranged*
- TECH456** (3)  
**Safety and Loss Control**  
 Safety and the fundamentals of accident prevention with emphasis on schools, school laboratories, and industrial applications. Introduction to the total program of loss control in industry, including the legal implications for both school and industry. Emphasis on the problem of accident prevention and control. *Spring*