

Department of Engineering & Computer Science

BS: Computing

The Bachelor of Science degree in Computing offers two emphases: Computer Science, and Software Systems. Computer Science goes beyond programming and focuses on theory, processes, models, algorithms, and other aspects of computational systems. Software Systems is an applied study of computing, focusing on development 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.

AERONAUTICAL AND AUTOMOTIVE TECHNOLOGY

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

Automotive Technology Center (US 31)
 (269) 471-6642
 Fax: (269) 471-6645
 coyg@andrews.edu
 http://www.andrews.edu/COT

Faculty

Gerald W. Coy, *Chair*
 James H. Doran
 Duane E. Habenicht
 Gary A. Marsh

Academic Programs	Credits
BT: Automotive Management	124
BT: Aviation Technology	124-129
Flight	
Flight/Business	
Flight/Maintenance	
Maintenance	
Maintenance/Business	
AT: Automotive Technology	62
AT: Aviation Technology	62-74
Flight	
Maintenance (52)	
Minor in Automotive Technology	20
Minor in Aviation Technology	25
Flight	
Maintenance (32)	
FAA-approved Part 141*	
Private Pilot*	
Commercial Pilot	
Instrument Rating	
Flight Instructor	
Multi-Engine Rating	
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, automotive 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.

AERONAUTICAL

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	8
General Education requirements	39-42
General electives	<u>17-0</u>
Total credits for degree	124-140

*Major Options

Flight

- Flight—35–38 credits
- Flight electives—10–7 credits
- Aviation electives—15 credits

Flight and Business

- Flight—35–38 credits
- Aviation electives—4–1 credits
- Business—21 credits minimum

Flight and Maintenance

- Flight—35–38 credits
- Maintenance—52 credits

Maintenance

- Maintenance—52 credits
- Flight/Aviation electives—8 credits

Maintenance and Business

- Maintenance—52 credits
- Business—21 credits minimum

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	<u>6-0</u>
Total credits for degree	62-74

*Majors

Flight

- Flight—27-29 credits
- Aviation electives—13-11 credits

Maintenance

- Maintenance—52 credits

Minor in Aviation Technology

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

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

Flight (32 credits): AFLT115, 116, 117, 215, 216, 217, 305, 306. A Commercial Pilot certificate and instrument rating are 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.

FLIGHT AREA COURSES

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

Required Courses—60

AFLT115, 116, 117, 215, 216, 217, 305, 306, and 307 or 455 and 456

A student may take any of the above courses under FAA Part 61 with the permission of the Chief Flight Instructor.

Aeronautical Technology electives are to be chosen in consultation with an advisor.

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

MAINTENANCE AREA COURSES

FAA Maintenance Certificates. Students may earn the following FAA-approved certificates from the department's Aviation Maintenance Technician School:

- Airframe
- Powerplant
- Airframe and Powerplant
- Maintenance students must obtain both the FAA Airframe and Powerplant license for any Bachelor degree.

Required Courses—52

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

AUTOMOTIVE

Two programs are available: A four-year Bachelor in Automotive Management, and a two-year Associate in Automotive Technology. Both programs give the student beginning-level skills in automotive repair. The automotive management provides a solid background in business. The Automotive Technology Center is located about 1.2 miles from the central campus. Students are expected to provide their own transportation.

BT: Automotive Management

Major requirements—68

AUTO135, 140, 150, 325, 330, 340, 350, 380; TECH140, 250, 390, 456, ACCT121, 122; FNCE317; BSAD355 plus 6 credits of electives chosen from BSAD210, 341, 384, 410; MKTG310 plus 3 credits of electives chosen from MKTG320, 368, 450

Cognate requirements—3

ECON225

AT: Automotive Technology

Major requirements—40

AUTO135, 140, 150, 325, 330, 340; INDT315; TECH456, plus 12 credits of electives chosen from AUTO350, 380 and other related courses.

All students in these two program options must have written two ASE exams by the end of their first year. By the end of the second year, they must have passed a minimum of five ASE tests in their respective option.

Minor in Automotive Technology

Automotive Technology—20

AUTO135, 140, 150; TECH140 plus 6 credits of electives chosen from auto technology.

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 hour dual instruction per credit hour enrolled.
Fall, Spring

AFLT115 (4)

Private Pilot Ground School

Ground training to prepare students for the FAA private pilot airplane knowledge test. Topics include aerodynamics, weight and balance, Federal Aviation Regulations, navigation, meteorology, aircraft systems and performance. *Fall, Spring, Summer*

AFLT116 (4)

Private Pilot Flight Training I

Flight and ground training to prepare a student through post solo flight. *Fall, Spring, Summer*

AFLT117 (4)

Private Pilot Flight Training II

Flight and ground training to prepare a student for cross-country flying and for the FAA private pilot airplane practical test. *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. *Fall, Spring, Summer*

AFLT216 (4)

Instrument Pilot Flight Training I

Instrument flight training from basic attitude flight through holding patterns. *Fall, Spring, Summer*

AFLT217 (4)

Instrument Pilot Flight Training II

Instrument flight training from instrument approaches, instrument cross-country flight and preparation for the FAA instrument rating airplane practical test. *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. *Spring*

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, Spring, Summer*

AFLT306 (4)

Commercial Pilot Flight Training

Flight training and solo-flight practice to prepare the student for the FAA commercial-pilot airplane practical test. *Fall, Spring, Summer*

AFLT307 (3)

Multi-Engine Flight Training

Flight and ground training to prepare the student for the multi-engine airplane practical test. *Fall, Spring, Summer*

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*

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** (3)
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. *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** (3)
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. *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 trouble-shooting 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*

AUTOMOTIVE TECHNOLOGY

AUTO104 \$ (2)
Personal Auto Care

Stresses the need for proper procedures in routine automobile maintenance. Helps the automobile owner become a wise consumer with emphasis on how to do simple tune-up, maintenance, and minor repairs. *Fall*

AUTO105 (1)
Automotive Consumerism

Consumer knowledge for the everyday challenges and decisions involved in automobile ownership. Topics include purchasing a new vehicle, how to choose a good repair facility, buying auto insurance, leasing, financing your purchase as well as how to deal with salespeople. When to sell or trade a vehicle along with how to protect your investment is also covered. Not applicable to a major or minor. *Fall*

AUTO135 \$ (4)
Engine Performance I

A course dealing with general engine diagnosis emphasizing ignition, fuel, air intake, emission and computer controls. *Fall*

AUTO140 \$ (4)
Brakes, Suspension and Steering I

A study of the hydraulic brake system including drum and disc diagnosis and repair. Steering and suspension along with basic wheel alignment will be covered. *Spring*

AUTO150 \$ (4)
Automotive Electrical Systems I

A course dealing with general electrical diagnosis and service procedures which covers: starting, charging, lighting, accessories and gauges. *Spring*

AUTO254 (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*

AUTO325 \$ (4)
Engine Repair

Includes general engine diagnosis and repair covering cylinder heads, block repair, lubrication and exhaust systems. *Fall*

AUTO330 \$ (4)
Engine Performance II

An in-depth study of engine diagnosis as it relates to ignition, fuel air induction, emission and computer controls. Use of diagnostic tools will be emphasized. Prerequisite: AUTO135. *Spring*

AUTO340 \$ (4)
Brakes, Suspension and Steering II

An advanced study of the hydraulic braking system including ABS diagnosis and repair. In-depth investigation of alignment, steering and suspension will be covered. Prerequisite: AUTO140. *Spring*

- AUTO350** § (4) **TECH315** (3)
Automotive Electrical Systems II
 In-depth study of the starting, charging, lighting systems along with accessories and gauges. Emphasis in computer application and control of the automobile operation. Prerequisite: AUTO150. *Spring*
- AUTO380** § (2) **TECH370** (3)
Heating and Air Conditioning
 A study of refrigeration theory and repair. Refrigerant recovery and recycling methods, heating and cooling principles are stressed. *Spring*
- AUTO425** (1-4) **TECH390** (1-4)
Automotive Services
 Designed to provide experience in automotive diagnosis, estimating, and repair. Students will work on assigned projects. Prerequisites: 20 credits of auto courses with a 3.00 GPA and listed in at least one specialty area by ASE. Repeatable to 8 credits. *Fall, Spring*
- TECHNOLOGY**
- TECH140** § (2) **TECH395** (1-4)
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) **TECH456** (3)
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*