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

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

<table>
<thead>
<tr>
<th>Academic Programs</th>
<th>Credits</th>
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</thead>
<tbody>
<tr>
<td>BT: Automotive Management</td>
<td>124</td>
</tr>
<tr>
<td>BT: Aviation Technology</td>
<td>124-129</td>
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<tr>
<td>Flight</td>
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<td>Flight/Business</td>
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<tr>
<td>Flight/Maintenance</td>
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<tr>
<td>Maintenance</td>
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<td>Maintenance/Business</td>
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<tr>
<td>AT: Automotive Technology</td>
<td>62</td>
</tr>
<tr>
<td>AT: Aviation Technology</td>
<td>62-74</td>
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<tr>
<td>Flight</td>
<td></td>
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<tr>
<td>Maintenance (52)</td>
<td></td>
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<tr>
<td>Minor in Automotive Technology</td>
<td>20</td>
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<tr>
<td>Minor in Aviation Technology</td>
<td>25</td>
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<tr>
<td>Flight</td>
<td></td>
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<tr>
<td>Maintenance (32)</td>
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<tr>
<td>FAA-approved Part 141*</td>
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<tr>
<td>Private Pilot*</td>
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<td>Commercial Pilot</td>
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<tr>
<td>Instrument Rating</td>
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<tr>
<td>Flight Instructor</td>
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<tr>
<td>Multi-Engine Rating</td>
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<tr>
<td>FAA-approved Part 147, Maintenance Technician</td>
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<tr>
<td>Airframe</td>
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<tr>
<td>Powerplant</td>
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<tr>
<td>Airframe and Powerplant</td>
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</table>
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.

<table>
<thead>
<tr>
<th>Major*</th>
<th>60-90</th>
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<tbody>
<tr>
<td>Degree core</td>
<td>8</td>
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<tr>
<td>General Education requirements</td>
<td>39-42</td>
</tr>
<tr>
<td>General electives</td>
<td>17-0</td>
</tr>
<tr>
<td><strong>Total credits for degree</strong></td>
<td><strong>124-140</strong></td>
</tr>
</tbody>
</table>

*Majors

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

**Maintenance**
- Maintenance—52 credits
- Flight/Aviation electives—8 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:
  - **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.

<table>
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<tr>
<th><strong>FLIGHT AREA COURSES</strong></th>
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</thead>
<tbody>
<tr>
<td>Private Pilot Certificate, Commercial Pilot Certificate, Instrument Rating, and either Flight Instructor’s Certificate or Multi-Engine Rating are required for any degree.</td>
</tr>
</tbody>
</table>

**Required Courses—60**


- 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**

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

See inside front cover for symbol code.

AERONAUTICAL FLIGHT

AFLT104
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
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
Private Pilot Flight Training I
Flight and ground training to prepare a student through post solo flight. Fall, Spring, Summer

AFLT117
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
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
Instrument Pilot Flight Training I
Instrument flight training from basic attitude flight through holding patterns. Fall, Spring, Summer

AFLT217
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
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
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
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
Multi-Engine Flight Training
Flight and ground training to prepare the student for the multi-engine airplane practical test. Fall, Spring, Summer

AFLT315
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
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  
Flight Instructor Ground School  
(3)  
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  
Flight Instructor Flight Training  
(3)  
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  
Basic and Advanced Ground Instructor  
(2)  
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  
Instrument Flight Instructor Ground School  
(3)  
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  
Instrument Flight Instructor Flight Training  
(3)  
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 instrument flight, analysis of instrument maneuvers, instrument approaches, and enroute operations. Fall, Spring, Summer

AFLT467  
Multi-Engine Flight Instructor  
(3)  
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  
Instrument Ground Instructor  
(2)  
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  
Techniques of Mission Flying  
(3)  
Develops special piloting skills required in remote undeveloped bush operations. Topics include piloting, 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  
Airline Transport Pilot Ground School  
(3)  
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  
Airline Transport Pilot Flight Training  
(3)  
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  
Applied Science for Aerospace Technicians  
(4)  
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  
Aircraft Basic Electricity  
(2)  
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  
Federal Regulations, Publications, Forms and Records  
(2)  
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  
Materials and Processes for Aircraft Structures  
(4)  
Includes hand and power tool usage, aircraft hardware and materials, precision measurements, corrosion control, non-destructive testing, and fluid lines and fittings. Fall

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

AVMT206  
Powerplant Electrical Systems  
(Alt)  
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  
Aircraft Systems  
(Alt)  
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  
Aircraft Fuels and Fuel Systems  
(Alt)  
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, troubleshooting, 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

AVMT228 (1–3)
**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

AVMT310 Alt (4)
**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
AUTO350 $ (4)
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)
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)
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)
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